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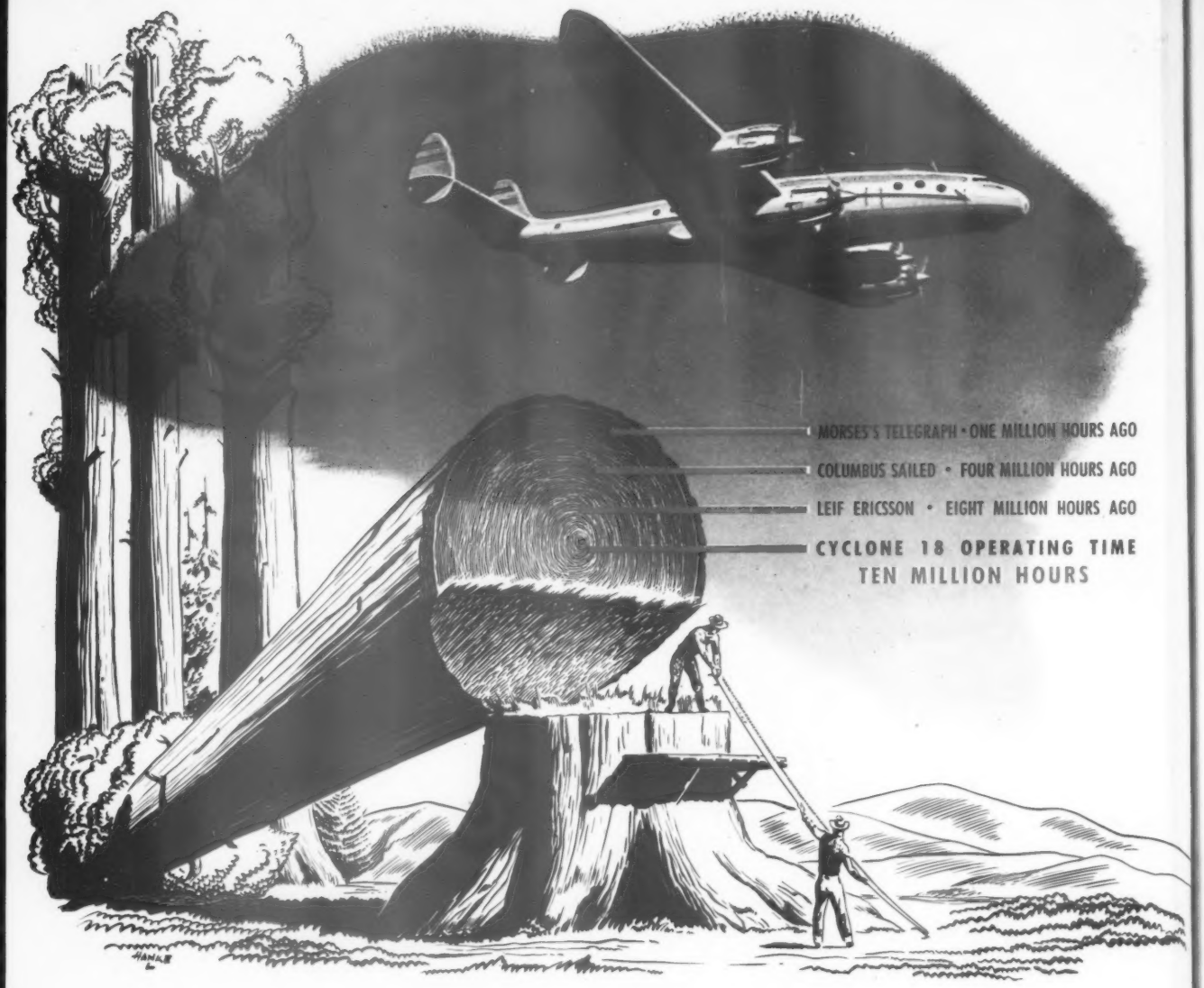
MORSE'S TELEGRAPH • ONE MILLION HOURS AGO
COLUMBUS SAILED • FOUR MILLION HOURS AGO
LEIF ERICSSON • EIGHT MILLION HOURS AGO
CYCLONE 18 OPERATING TIME
TEN MILLION HOURS

Centuries of Power *behind the Constellation*

A year is only 8760 hours. The Wright Cyclone 18 has a total flight and test time of *ten million hours.* In hours, years or annual rings in a tree, that's eleven centuries of time.

In the war years, the Cyclone 18 has gone through a fast, grueling development program. No other engine has ever had to take such punishment — excess temperatures, overloads, overspeeding, lean mixtures and maintenance handicapped by supplies.

From that usage, however, came continuous refinement and design changes . . . improvements which paved the way for increases in performance not only of bombers, but of all types of planes powered by the Cyclone 18.

Thus, the Cyclone 18 built today for planes such as the Lockheed Constellation is the sum of this ten million hours of experience. The forced acceleration of war has produced an advanced engine, years ahead of its time, for all types of planes.

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FLYING

NOVEMBER, 1945

VOLUME 37 • NUMBER 5

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RADIO NEWS

PLASTICS

INDUSTRIAL AVIATION

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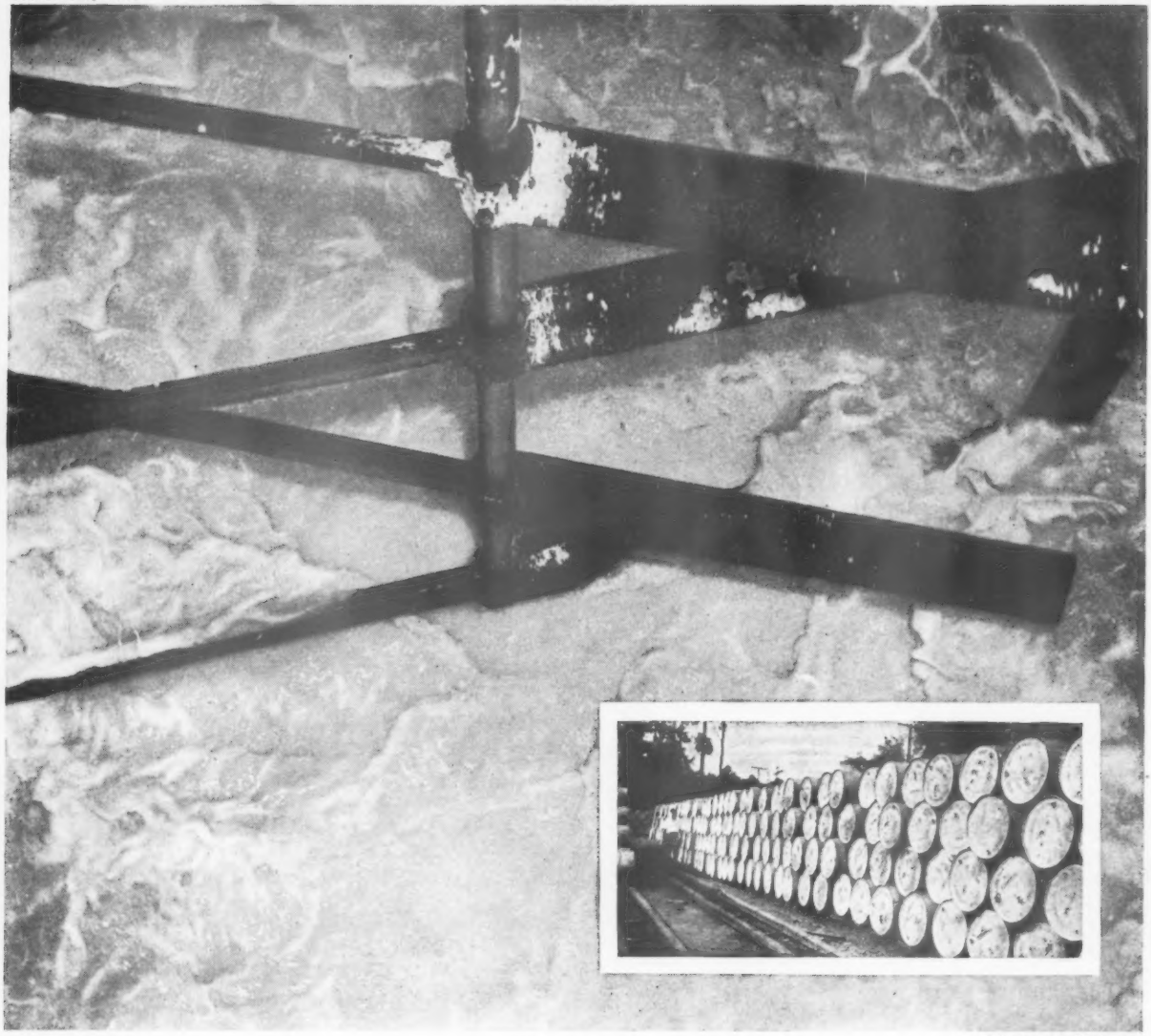


Soap from pine trees helps make better tires

Another example of "building for today, testing for tomorrow"

IN THE large vat above, and in the barrels awaiting shipment, is more soap than most people will use in a lifetime. But nobody is going to bathe with it. It will be used in making synthetic rubber for tires—a new kind of synthetic rubber developed by B. F. Goodrich.

Some sort of soap is used in making all types of synthetic rubber. Until recently it was soap derived from animal fats. The new soap shown here is made from rosin that comes from pine stumps. This different soap makes a definite improvement in rubber.

Tires made from the new rubber give more wear than tires made from ordinary synthetic. They run cooler . . . and this is important, because heat destroys rubber. It's doubly important in heavy load carrying tires, which often get boiling hot.

The new rubber was developed several months ago and made in plants operated for the government by B. F. Goodrich. It was used in airplane and other military tires, and was kept a military secret. Then it was released for use in heavy-duty tires. Today it is going into all types of airplane tires made by B. F. Goodrich.

This is only one of dozens of improvements that B. F. Goodrich has made since offering the first tires containing synthetic rubber ever sold in America—in June, 1940. All these improvements are indications of the kind of extra value, extra wear, and extra safety you get whenever you buy a B. F. Goodrich tire. *The B. F. Goodrich Co., Aeronautical Div., Akron, O.*

Skyway or Highway

B.F.Goodrich

FIRST IN RUBBER

Planes WON'T Sell For $1,000

Hand-built methods, as in Stinson factory, produce excellent planes, but they are expensive by mass-production standards.

By JOHN C. ROSS

The only hope of drastically slashing the prices of planes is to put them into genuine mass production

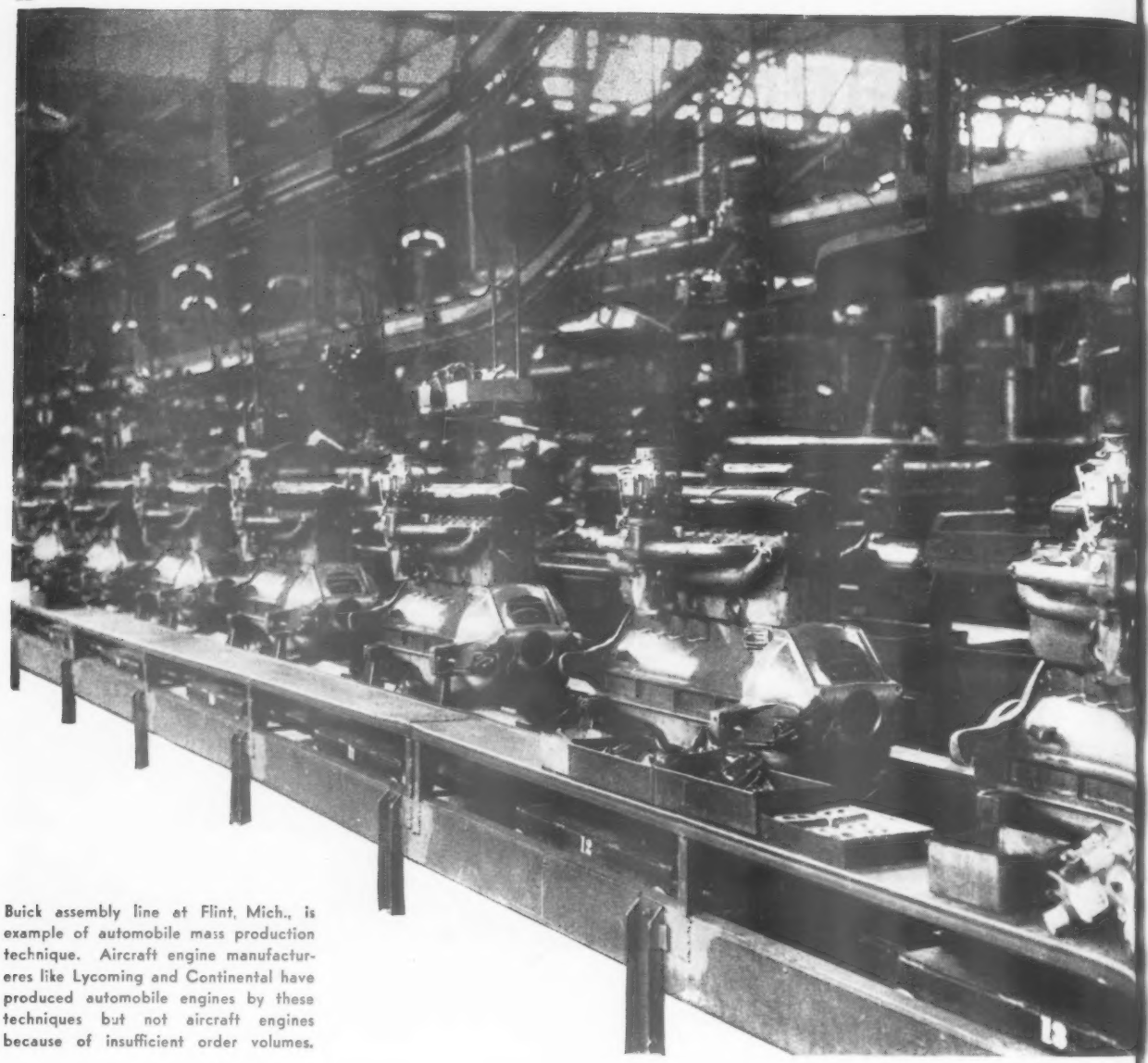
WITH everything else more expensive, how can we honestly expect the cost of airplanes to go down? We've all heard a lot about the post-war $1,000 plane, but it has always been so far in the future that it never seemed quite real to us. Unfortunately, despite all the predictions we have heard, it is hardly any more real today.

Except for extremely low-powered, stripped-down planes, without brakes, minimum instruments and so forth, modern lightplanes have been far above any "ideal" $1,000 price. Yet is a $1,000 price for a two-place lightplane so much out of line?

Certainly it is by present small-production, hand-built methods. But it would be a fair enough price if we could mass-produce lightplanes in the sense that automobiles are mass-produced. What are the possibilities of doing that, and of reducing the cost of aircraft in other ways?

It must be conceded that, at $2,000, airplanes are too expensive to reach a mass market. And unless they do reach that mass market, of course, they can never be mass-produced. What a half million Americans who want their own personal planes right now are up against is a log jam that works out something like this:

Most of us can't afford to own our own planes because they cost too much to keep up. They cost too much to keep up largely because, they're too expensive to buy—for several reasons, some explained later but certainly one of the most important being be-



Buick assembly line at Flint, Mich., is example of automobile mass production technique. Aircraft engine manufacturers like Lycoming and Continental have produced automobile engines by these techniques but not aircraft engines because of insufficient order volumes.

cause they aren't mass-produced. They aren't mass-produced because people can't afford to buy them on that basis.

This log jam is somewhat like that confronting television, where the sets are expensive because they aren't mass-produced, and they aren't mass-produced because not enough people can afford them at present prices, and because television broadcasting is on a limited basis because there aren't enough sets. Technological problems enter the picture, of course, but it's still basically the same old merry-go-round of mass production.

There were only four automobiles in the United States in 1895. Ten years later production was 30,000 units a year. But early automobiles like the Ford and the Oldsmobile were cheap—under $500—and had considerable utility from the beginning because of the good roads movement which had been started by the bicyclists some years before.

So the automobile industry was able to start out on a mass-production basis almost from the beginning. The four cars of 1895 grew to 8,000 in 1900, 77,400 in 1905 and 458,500 in 1910. No 15-year period in aviation can show any comparable growth. There were 2,612 registered private airplanes in the United States in 1927, 10,090 by 1931 and only 24,134 in 1941—14 years later.

The same mass-production dilemma still confronts aviation. If $2,000 is a good average low price for a plane, that price is probably too high to achieve a mass market. Not only is the original cost too high but, because of the original cost, the upkeep is made much higher.

John H. Geisse, special assistant to the Administrator of Civil Aeronautics in charge of private flying, gives these figures for the cost of operating an average $2,000 lightplane on a basis of minimum, average, and extensive use:

	100 Hours	200 Hours	1,000 Hours
Direct Operating Cost	$ 177	$ 354	$1,770
Rent at $15 per month	180	180	180
Depreciation	200	200	200
Hull insurance	310	310	310
Liability and property Damage	148	148	148
Total annual cost	$1,015	$1,192	$2,608
Cost per hour of flying	$10.15	$5.96	$2.61

Note these figures well. They show

WHY YOU WON'T BUY A PLANE FOR $1,000

1. A 65-h.p. two-place lightplane costs $1,400 to build today.
2. At wholesale prices, the engine alone costs $375. By the time you buy it, you may pay as much as $750.
3. Major components add another $200 to the final cost of the plane.
4. There is no true mass production in the aircraft industry in the sense that it exists in the automotive industry.
5. First costs and operating costs are so high that mass production, which could lower these prices substantially, is not yet in sight.

◀ Every dollar saved in the direct cost of manufacturing a plane would reduce the cost to you by $2. ▶

why it costs you $10.15 per hour to operate your plane 100 hours a year. They show why, if you fly 1,000 hours a year, your cost is slashed to $2.61 per hour. There is a high fixed cost in operating a plane, no matter how few hours it is flown. You will be especially hard hit by this high fixed cost if, as an average pilot, you fly only 100 to 200 hours per year.

That high fixed cost is very largely dependent upon the first cost of your plane. Assume, for example, that operating costs are relatively the same, but that your plane costs only $1,000 instead of $2,000.

	100 Hours	200 Hours	1,000 Hours
Direct operating costs	$177	$354	$1,770
Rent	180	180	180
Depreciation	100	100	100
Hull insurance	155	155	155
Liability and property damage	148	148	148
Total annual cost	$760	$937	$2,353
Cost per hour	$7.60	$4.69	$2.35

Note in the above table that your operating cost has been reduced a fourth—or $2.55 per hour—if you are in the 100-hour-per year class. It is generally conceded that the average man will buy a car before he will a plane. But with planes costing $1,000 less, he not only could have his car but, with his annual aircraft operating cost reduced $255, he would have enough money to operate it. He could buy a new $1,000 plane every four years with the $255 he saved annually in fixed charges by having a $1,000 plane.

It would be a mistake, however, to imply that the original cost of a lightplane is the only critical factor in operating cost. A good many fixed-base operators today charge as much as the traffic will bear. Their rents are too high; they charge outlandish prices for repair work. Those who conduct generally sloppy operations increase the insurance rates for the good operators and all these costs are passed on to the poor plane owner.

One way by which the bottleneck may be broken to increase the market, therefore, is to reduce operating costs generally. Better operating methods will mean lower insurance rates. Better service will encourage more owners. One large operator is proposing to standardize on one engine and develop an assembly-line overhaul for all such engines at one low price.

How can good operations reduce the cost of insurance? At one airport recently, where the operator had ignored advice that he could save himself money by improving his management, an unchocked lightplane, propped without an operator at the controls, ran out of control into another nearby lightplane, ruining the operator's last two trainers. But this operator didn't pay for the damage except in loss of business. *You did*, if you own a plane and pay insurance. If the heavy cost of insurance could be halved eventually, the cost of operating your $1,000 plane 200 hours a year would be reduced at least one-sixth—or over $150 per year, using Geisse's figures on insurance cost.

Now how can we go about reducing airplane cost—the other key to the whole log jam preventing mass production?

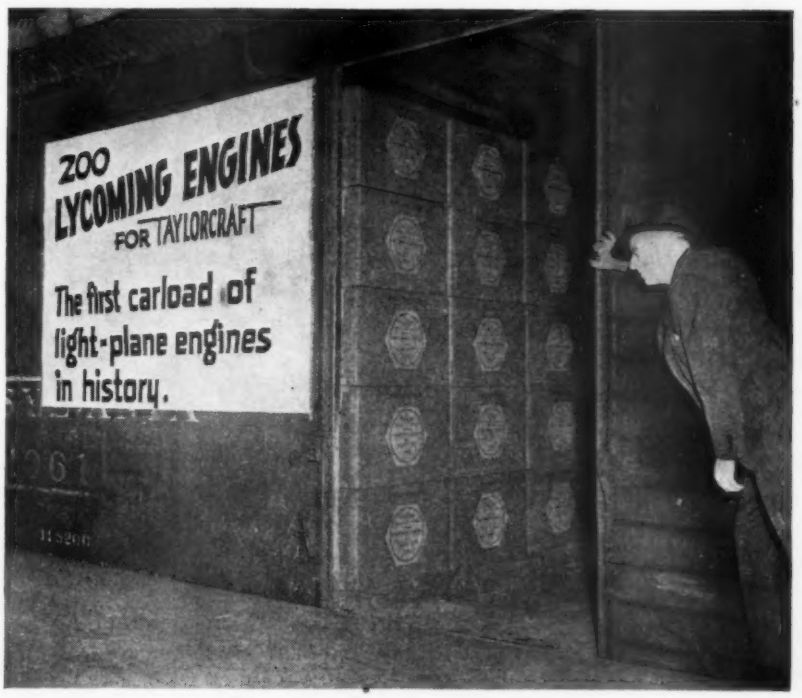
Many lightplane manufacturers throw up their hands and say it can't be done. Nevertheless, there has been a steady reduction in plane prices in the past 15 years. A good monoplane with a 65-h.p. engine in 1929 cost about $3,500. A better monoplane with a 65-h.p. engine 10 years later was selling for about $2,000.

There's much to be said on the side of this $2,000 price as long as planes have to be made by hand. Two men who have studied the problem in detail, A. G. Tsongas, and F. S. Macomber, chief engineer and industrial engineer, Stinson Division, Consolidated Vultee Aircraft Corporation, believe that the costs of a typical lightplane should break down something like this:

	Direct Cost	Per Cent of Total
Raw material	$ 200	10.0
Purchased Parts	590	29.4
Direct labor	230	11.5
Tooling	70	3.5
Engineering	25	1.2
Total	$1,115	55.6
	Indirect Cost	**Per Cent of Total**
Overhead	$ 288	14.4
Manufacturing cost	1,403	70.0
10 per cent profit	140	7.0
Wholesale cost	1,543	77.0
Dealer's commission (30 per cent)	463	23.0
Selling price	$2,006	100.0

These are hypothetical figures only. Now take the actual costs of one light-

(*Continued on page* 68)



When Lycoming shipped a carload of 200 engines it was important news to the aircraft industry; yet auto mass-production volumes are such that a factory turns out that many in a few minutes.

SHOULD YOU SCRAP

YES

Says

OLIVER READ

Managing Editor, Radio News

New radio frequency benefits outweigh financial losses in replacing present plane sets.

THOUSANDS of two-way radio transmitters and receivers will soon be obsolete as the result of new frequency assignments for flyers.

Aviation communications alone has not been chosen for this "conversion." Other services, too, have been moved to new frequency channels. FM, in particular, finds its new band at frequencies much higher in the spectrum than had been anticipated. The change will soon result in obsolescence of 500,000 FM receivers unless the user elects to tolerate an adapter.

In addition, many FM transmitters will have to be redesigned, altered, or scrapped. This changeover is not the easiest thing to sell the public—but it is necessary if full advantage is to be gained by giving FM new frequencies for improved public service. The FCC has no axe to grind. It is vitally concerned in assigning wave lengths that have been proven to be technically correct and adequate to fill the particular requirements of the service demanded.

Amateur radio, too, has been reassigned to new channels. In many cases "ham" operators must junk their crystals and alter their transmitters in order to operate. They aren't complaining. They know that they have gained far more than they have lost.

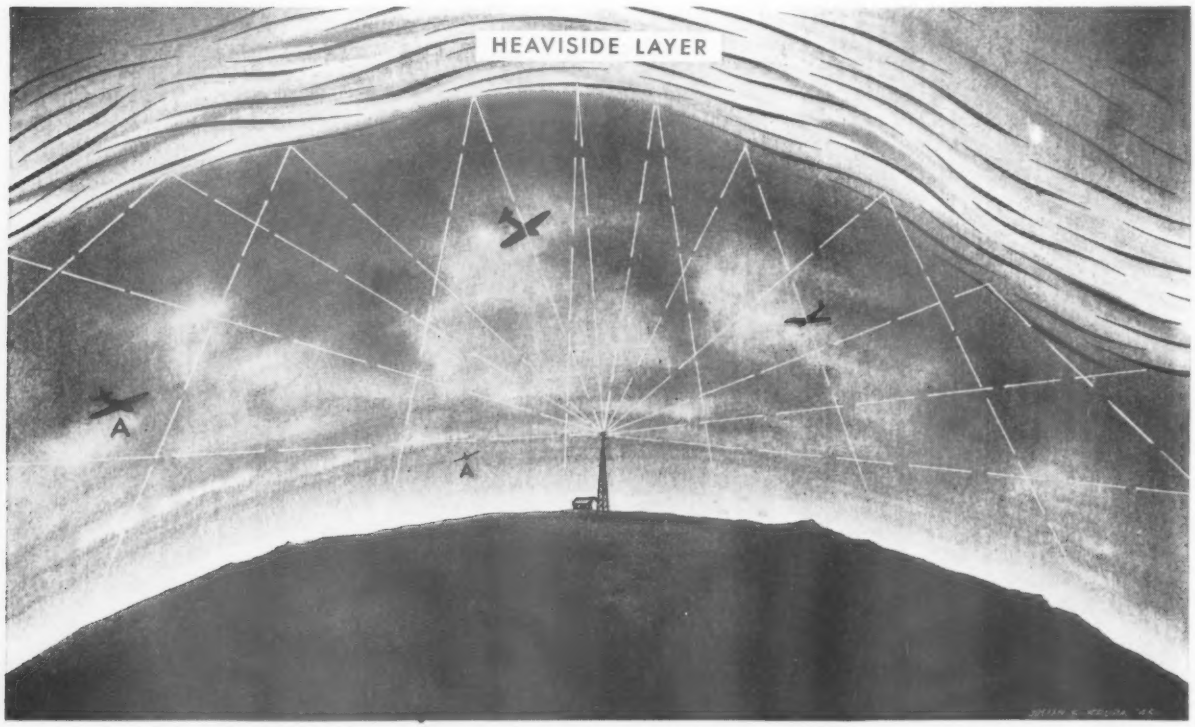
But what about the private flyer? Will he gain or lose in the deal? We think he wins—hands down. Can existing sets be converted to the new high frequencies? In most cases they can't. The loss in efficiency is too great, and the end result would be a mediocre communications system at best.

There's a brighter side to the picture, however. Batteries, microphones, general wiring and power supplies can be salvaged. New equipment, employing highly refined vacuum tubes, will reduce the battery consumption to a great extent. Therefore, if your present radio transmitter puts out 10 watts at a drain of 10 amperes from the battery, a new one may put out 20 watts, or twice the power of the old one, and still only draw 10 amperes. Or it may retain a 10 watt output and draw only five amperes from the battery.

New sets will be much lighter in weight and component parts much smaller. The overall dimensions should be reduced considerably.

Antenna systems will be more compact

(*Continued on page* 100)



This diagram shows action of present-type radio waves. They travel in all directions from the tower and eventually strike the uneven surface of the heaviside layer, from which they are reflected back unevenly. Thus, planes labelled "A" might be in dead spot.

YOUR RADIO?

NO

Says

KURT RAND

Private pilot and frequent contributor to FLYING

Transition problems and cost of new radio raise doubts in mind of this observant pilot.

EVERYONE in aviation accepts the statement that VHF (very high frequency) radio facilities will provide vastly better service for non-scheduled civil aircraft operators. But questions are being asked by private owners and small operators which indicate that all is not beer and skittles on this cozy little deal. Granted everything that's been said for VHF, how about some of the things that may be wrong with it?

My first thought, as a private pilot, is on cost. How much is my VHF set going to cost me? If I can't afford it, wouldn't I rather keep my present set in its present place in the radio spectrum with all its disadvantages?

Will my present low-frequency equipment continue to be useful for a year or so, or will I have to junk it just as soon as Washington can make up its mind what frequencies we private pilots are going to use?

Again, will I have to carry both my present radio and a VHF set in my plane during the transition period? Supposing I use only one set, which one will it be? Will there be places where I could use my present set to greatest advantage because not enough VHF ground stations have been installed? Or suppose I do have the VHF set with me and the VHF ground network isn't complete?

How are these new VHF sets going to operate, anyway? What will I have to learn? Or is it going to be too complicated for me to try to learn?

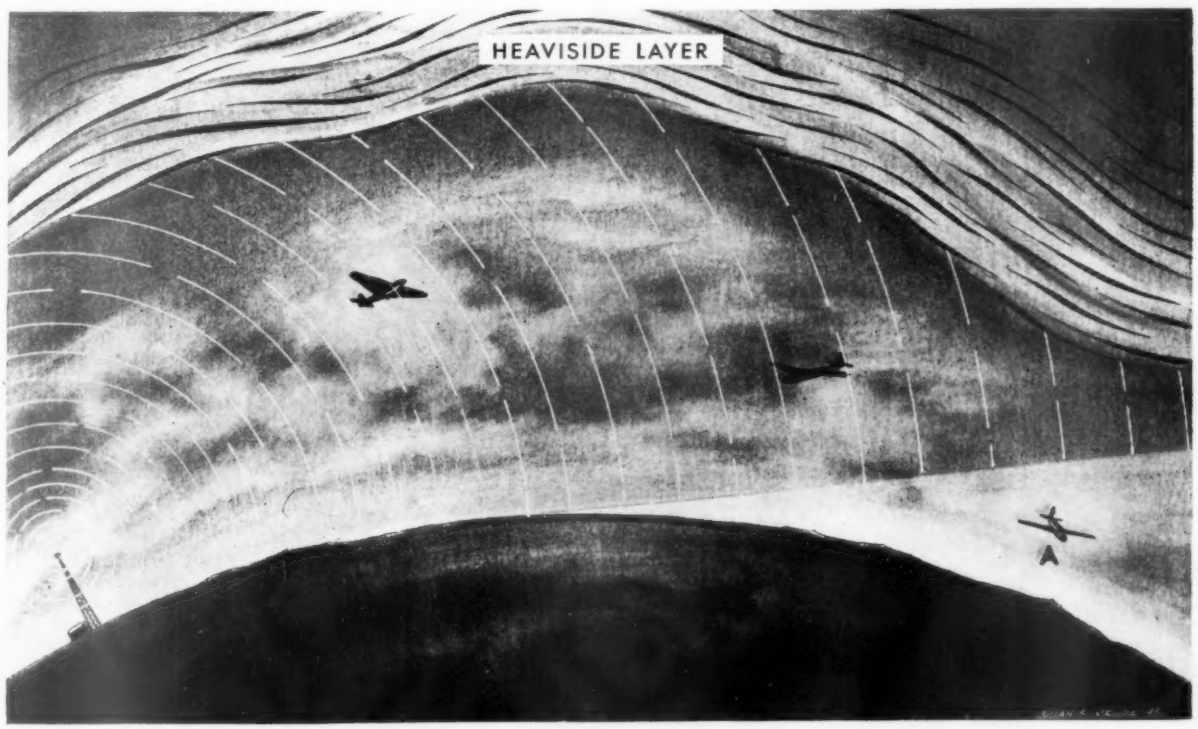
Silly questions, maybe? Well, I just don't know and I'm satisfied that some of the answers don't yet exist today.

First on this matter of cost. I'll concede that eventually the cost of VHF sets will be reasonable enough. But I will need one immediately. I won't be able to wait for the cost to go down. There isn't much chance of converting my present set because it wouldn't be efficient. So even if VHF sets are reasonable in cost, I still have to buy at least one extra radio set and I'm not too happy about this expenditure.

I'm particularly worried about being able to afford the visual means of flying VHF ranges. Maybe the direction-indicator won't be as expensive as I've been led to believe, but my fingers are crossed. What about all the crystals I'll have to have for multiple frequencies?

As to carrying both my present and my

(*Continued on page* 108)



Although high frequency transmission travels in all directions, it follows a "line of sight", thus could not be heard by plane A which is below horizon line of transmitting station. Other planes in the sketch would get static-free signals.

In Alaska, the dog-team sled requires months to travel the same distance that its modern successor, the airplane, can cover in a few hours.

ALASKA—
Frontier for Flying

By CHARLES E. PLANCK

An aerial tour of the land of the Midnight Sun offers a new challenge to pilots.

WITH some 8,000 miles of Federal airways, 22 major fields and 15 intermediate fields, Alaska has the welcome sign all ready for private flyers now that the war is over. A quick once-over of Alaska's scenic and sporting attractions convinces you that here is a place any pilot will enjoy visiting.

Hardy Alaskan flyers will tell you that winter is a wonderful time for seeing the Territory from the air. Considering that daylight lasts for two to five hours a day in the winter and that the temperature sticks around below the zero mark, you'll probably decide on summer. In the summer, with the temperature around 50°, you can fly 24 hours a day in daylight.

Right away the economic angles also ought to be set down. Unless you are what the Alaskans call "rugged" don't try the tour in a lightplane with a 200-

With many bays, rivers and lakes available, float-planes like this Bellanca (in hanger) and Stinson are widely used in Alaska.

mile range. It can be done, has been done, by both men and women pilots. But Alaska offers so many attractive flights that require a bit more of the airplane that something with better performance is indicated.

Likewise, the pocketbook for expenses should have a greater range. Prices in Alaska are higher, service costs more, emergencies can be and usually are more costly. In brief, the private pilot who has a plane of at least 125-225 h.p., with a range of around 500 miles, and with capacity for two passengers, with an ample baggage allowance and room and lift for special emergency equipment, is the man who will be happiest flying over Alaska. Lay your vacation budget alongside the tables of approximate costs on page 82 and decide whether it is to be Alaska or a national park closer to your home.

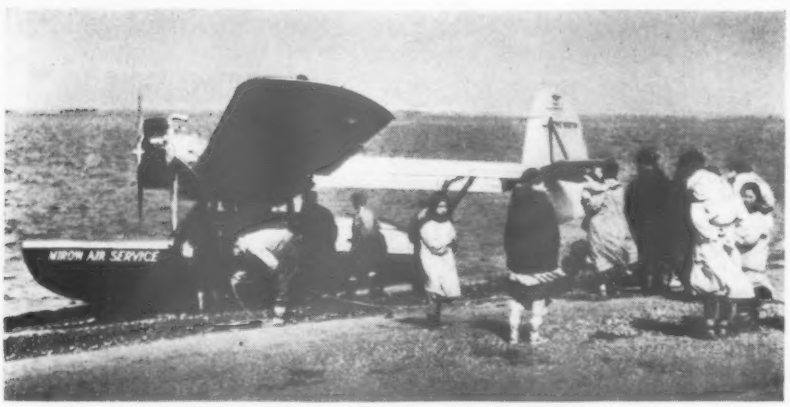
Advice on the subject of aerial touring in Alaska comes from veteran pilots who have been through the passes, landed on strange fields, seen the inspiring sights and hunted for lost flyers in the spongy muskeg in the summer and over frozen snow in winter. Some are enthusiastic in their advance welcome to aerial tourists, most of them are middle-of-the-roaders, but only a few are downright pessimistic about the whole business. Pinned down, however, every one will admit such touring is feasible and will wax enthusiastic about the things a flyer can see from the air and on the ground.

It is natural that a man who has flown over Alaska should question the ability of newcomers to get along well in that region. Every pilot adds a "yes, but" when he says flyers from the States can tour the territory safely. He usually goes on to emphasize the importance of taking the precautions necessary for all pilots in Alaska, and especially for newcomers. These precautions are mainly strict adherence to the rules laid down by the

Emergency provisions on CAA Boeing 247-D include rubber boat, sleeping bag, gun, fishing tackle, blow torches, signal-sending device, adequate food for 10 days.

Ski-equipped 1926 Bellanca, still used over some routes by Wien Airlines, loads passengers at its sea-ice base at Nome. Skis are used throughout the year in some regions.

New CAA field with 7,500-foot runways on Strawberry Point at Gustavus, is largest along "outside" airways between Alaska and States. Serves as Juneau alternate in bad weather.



Although few Eskimos at Elephant Point on Eschscholtz Bay, Kotzebue Sound, have ever seen an automobile or train, this Sikorsky S-39 amphibian is a familiar sight to them.

CAA for flying the airways, and the maintenance of proper equipment for use in emergency landings in Alaska's "bush" country, in both summer and winter flying.

Jack Jefford, chief of the air transportation branch of the CAA's Eighth Region at Anchorage, has an extensive Alaskan background. He is a "bush" pilot turned "instrument." He has flown where there were no airways, where there were no fields, and where airplanes had never been seen before, although that is becoming increasingly hard to do in Alaska.

"What about aerial tourists in Alaska after the war?" I asked him.

"I hope we don't have too many of them coming up here right away," he said, almost involuntarily. "Why we'd spend all our time out hunting for them. They'd be down all over the place."

His first reaction is typical of that of many Alaskan pilots. Later, however, their views change and they usually admit they personally would welcome aerial visitors and spend hours with them sharing the knowledge they have of the particular problems likely to be encountered.

There is a picturesque pioneer tendency to "kid" the newcomer. They will tell you tales with straight faces that can stretch your credulity all out of shape. Paul Miller will tell of the parrot which a pilot used as a blind flying instrument. Sitting on a horizontal bar in front of the pilot, the parrot leaned right and left as the opposite wings dipped and walked completely around the bar when the plane looped.

Archie Ferguson of Kotzebue, legendary and most voluble of all Alaskan bush pilots, tells the wildest sort of tales connected with Alaskan flying. His account of the bear cub which loosed itself while he was flying it across country, and climbed up in the seat beside him to help fly his Cessna, is a classic.

And Dean Goodwin, flying down to Wrangell, got lost. He wasn't sure whether he was following the Stikine River or an arm of the gulf, only one of which would lead him to Wrangell. Since he was flying a float-plane, he landed, stepped down on the pontoon and tasted the water three times at 10-minute intervals. The water was sweet, so he decided he was following the river and finally hit Wrangell right on the nose.

In Alaska there are no railways, no roads, no air markers, and, over the great expanses of tundra at least, no natural landmarks by which new pilots or the 700 certified Alaskan pilots can navigate. The railroad runs from Seward on the Gulf of Alaska up through Anchorage and to Fairbanks, 470 miles in all. That's the only "iron compass" in all the territory. There is a highway from Fairbanks, down to Valdez on the Gulf, 381 miles long. A road from Anchorage, 140 miles long, connects with this road. The only other road in Alaska is the northwest end of the Alcan Highway ending at Fairbanks. Other roads start bravely from cities, only to peter out five to 10 miles away.

A few years flying up here provides

(*Continued on page* 80)

IATCB
AIR TRAFFIC TROUBLE SHOOTERS

IATCB members are (seated, left to right) Colonel Marriott, Mr. Postle, Mr. Neimeyer, Commander Nivling and (standing, left to right) Lieutenant Colonel Cornish, Captain Mitchell, Lieutenant Colonel Hartranft and Lieutenant Commander Garrison. Messrs. Koch, Cole and Huber are not in this picture.

By
FRANKLIN D. WALKER
Associate Editor, Washington

AMONG the war-sponsored Governmental agencies which may have proved by their wartime operations that they are indispensable to peacetime activities is the Interdepartmental Air Traffic Control Board.

Perhaps the least-publicized organization in Washington, the IATCB is one of the most powerful, since it governs the allocation of all navigable air space over the United States and adjacent coastal waters. Its word has been wartime law in the settlement of disputes between military and civil aviation interests.

The need for such an over-all board to resolve conflicts in the use of air space since the war ended will be determined by the scope of our military operations in peacetime and by the number of civil aircraft. If a large military establishment, including a sizeable air force, is to be maintained, some sort of co-ordinating agency will be necessary to prevent interference with the rapid expansion of civilian flying, particularly in the personal aircraft field. That agency could well be the IATCB.

But whether or not IATCB is retained in its present form, continued on a modified basis or discarded, it will go down in history as a unique wartime agency. Its story is told here for the first time.

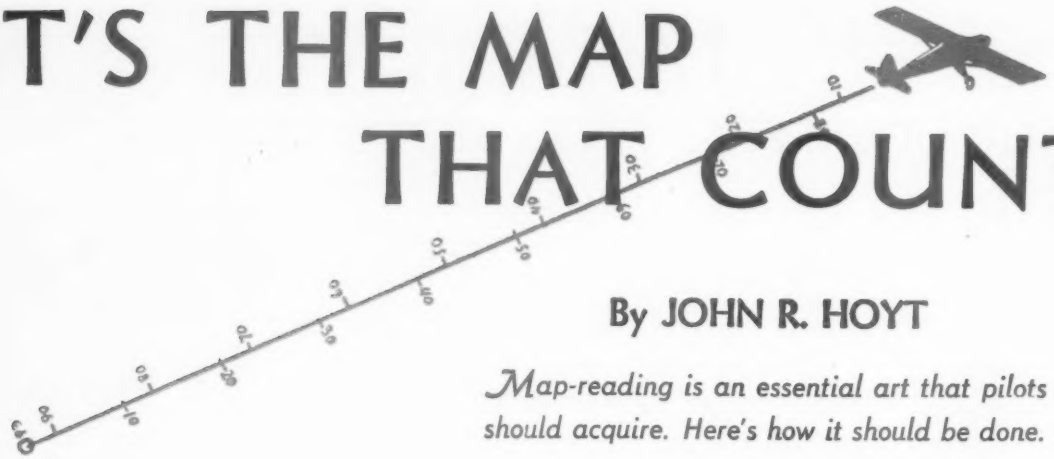
IATCB is a four-man deliberative body through which are funneled such items as plans for the construction, development, location and relocation of all airways, airports, air navigation aids, aerial bombing and gunnery ranges, military and civil flying schools, radio towers, munitions plants, tactical unit bases and ordnance proving grounds. IATCB also serves as the clearing house for proposed revisions in policies and regulations affecting the use of air space, and establishes any restrictions necessary to promote safe operations of military and civil air traffic.

The organization is unusual among Governmental agencies in that its decisions bind all its affiliates—War, Navy and Commerce Departments and the Civil Aeronautics Board. If the board is not unanimous in a given decision, the case goes up to the Air Co-ordinating Committee (formerly War Aviation Committee), comprising the Assistant Secretaries for Air of War, Navy and Commerce, an Assistant Secretary of State and the chairman of the Civil Aeronautics Board. It is a tribute to IATCB procedure that not more than a dozen cases have gone to this Committee and none has been passed up to the President, the court of last resort.

The vast scope of IATCB activities

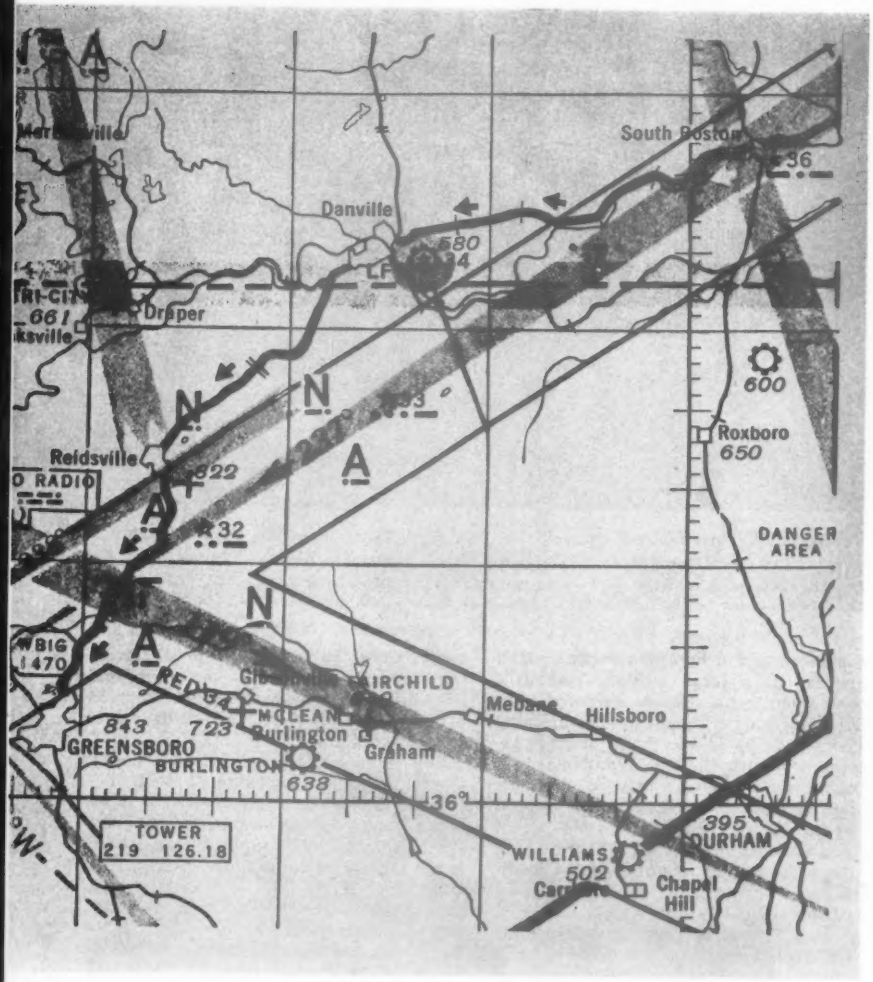
(*Continued on page* 85)

IT'S THE MAP THAT COUNTS



By JOHN R. HOYT

Map-reading is an essential art that pilots should acquire. Here's how it should be done.



Washington, D. C.-Atlanta, Ga., route is one of toughest in U. S. from point of navigation. One section, above, indicates scarcity of checkpoints and airfields in case of emergency. Flying over this area pilot could follow single-track railroad (heavy line) from South Boston to Danville, Va., picking up double tracks at southwest edge of Danville, following them through Reidsville, N. C., into Greensboro, N. C. Between latter points, pilot could also "home" on station WBIG if plane had a radio and loop antenna.

THE pilot was at 14,000 feet over Tucson, Ariz., on instruments. Without warning the compass bowl cracked and the kerosene leaked out. Although he was due to go "contact" somewhere near Rodeo within the next half hour, the pilot wasn't worried. He still had his radio, a directional gyro, *and a map.*

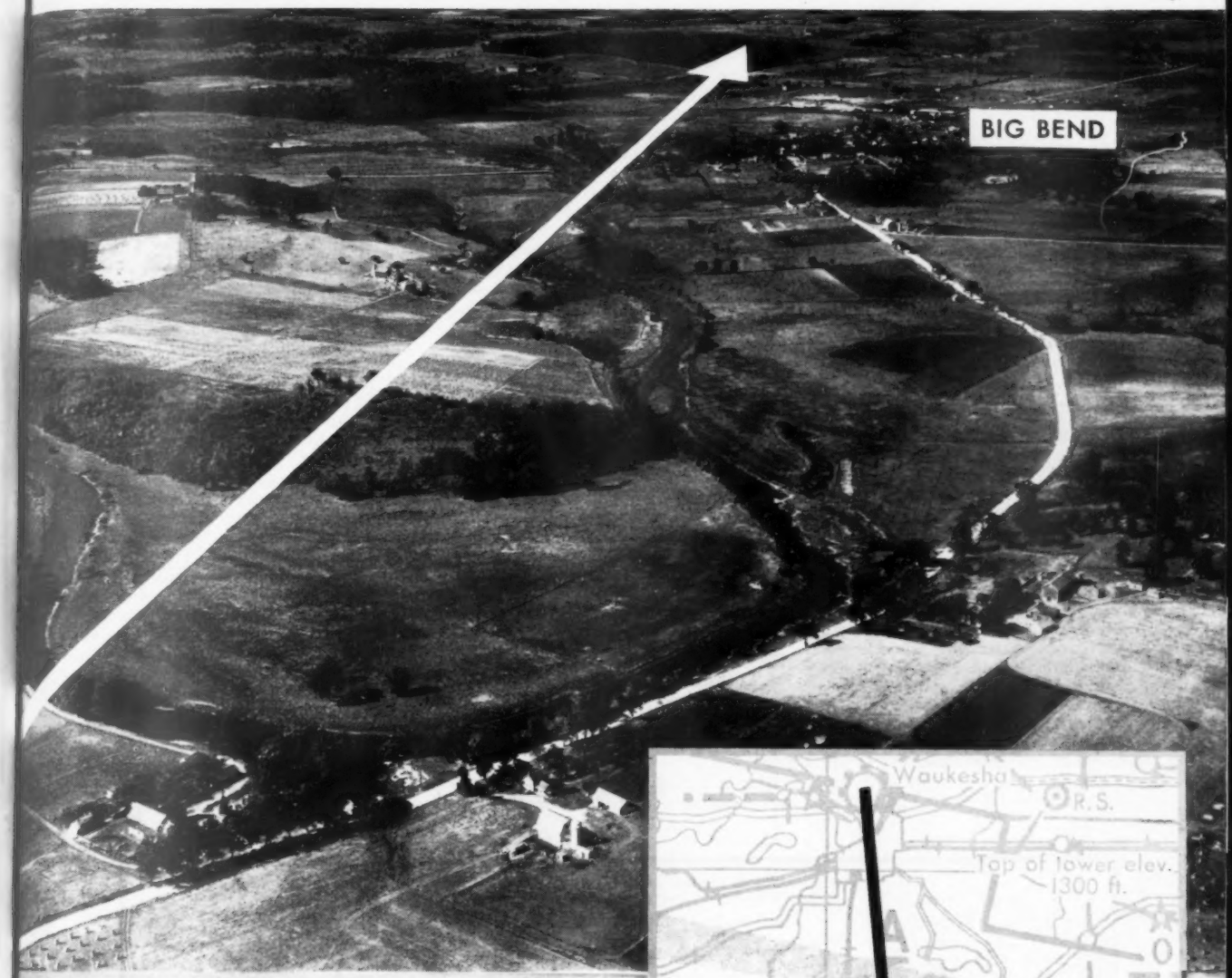
Of course the unexpected happened. Just as the ground appeared and he became contact, the radio went out! Although he knew almost exactly where he was, his approximate course, drift, and groundspeed, this pilot was confronted with the problem of *pin-pointing* himself to his destination, Big Springs, Tex. Could it be done without compass or radio?

Probably not, if the pilot hadn't been very familiar with his map. The sectional chart that he was using could tell him everything he needed to know; but he had to know how to read and interpret map-language. To an uninformed pilot the information might as well be written in prehistoric ideoforms for all the good it would do. The time to learn map-reading is not in an airplane when one is about to become lost, or is lost.

If you know your map, it is entirely possible to fly over tough terrain, like the Tucson-Big Springs airway, with no other navigational aid. Such flying is difficult, and should not be attempted by a novice without practice and know-how.

"Experience" consists of: (1) Sufficient map-study to attain the ability to translate map signs into mental images and to correlate the mental images with terrain. (2) Actual experience in cross-country flying, with compass masked out, radio turned off, and a finger held on the map every moment, literally pin-pointing the position from minute to minute.

First of all, obtain an up-to-date Aeronautical Sectional Chart, now available from the U. S. Coast and Geodetic Survey, Department of Commerce, Washington, D. C. Your local airport may now have the ones you require, as wartime restrictions have been lifted. Each chart covers a strip of the United States from 200 to 400 miles wide; hence, they are often called "strip maps." Priced at



A CHECKPOINT AS SEEN ALOFT AND ON YOUR CHART

If you flew from slightly east of Waterford, Wis., to Waukesha, one checkpoint would be Big Bend, Wis. At right is how it appears on the Milwaukee sectional chart, and above, how it actually would appear to pilot. Map arrow points to kink in stream where channel parallels highway just before road turns northwest to town. In picture the plane is on east side of course (white line) but for all purposes is still considered on its course. On an actual trip, the pilot would mark off distances in miles on map's course line at intervals depending upon the plane's speed.

twenty-five cents, they are a worthwhile investment.

Some old-timers were content with automobile maps—a very foolish economy because the aeronautical chart is more than a map: it is a piece of fine engraving of unbelievable accuracy and detail. It not only contains such things as small roads, lakes, race tracks, etc., but is kept up-to-date when new additions like bridges, roads, or man-made lakes are built. There is such a wealth of detail that a pilot can locate himself on the map within the area of a pinpoint: hence the term, *pin-pointing*.

For a flight from Tucson to Big Springs we obtain the Phoenix, Douglas, El Paso, and Dallas strips. We draw a line from our point of departure to the destination and carefully mark the mileage on the *right* side of the line in 10-mile divisions. Later, on the return flight, we mark our course on the other side of the line.

Noting the estimated time of arrival on the course line is *not* advisable, because variance in the estimated wind direction and velocity often can throw out the figures written down for the remainder of the flight.

Before studying the map further, we should know something about maps in general. To draw a straight line between two cities on some types of map would take us far out of our way; for example, the Mercator charts in geography books are not the best for pilots because they are distorted. Compare Greenland on a Mercator chart with Greenland on a globe and the distortion is apparent.

Sectional charts, on the other hand, are Lambert conformal projections, so called because they conform to the earth's surface. The map is made in this manner: if a cone, such as a dunce cap, were placed on a globe, it would touch the globe at certain parallels of latitude. The map on the cone would *conform* to the map on the globe, with hardly any distortion, and a line from one city to another would be the shortest distance on the earth's surface, in other words, a great circle course.

Thus the mileage and the route can be computed direct from a strip map, or one may use the latitude divisions, which are always equal to nautical miles (a nautical mile equals one minute of latitude; 60 nautical miles equal one degree).

Lambert map is transfer of latitude and longitude from globe to a cone.

Now let's study the map and learn its sign language. For simplification, we may divide the study into two parts, the earth itself, called "topography," and, data for pilots, such as radio beams, airfields, etc.

Topography is divided into water, land, and man-made improvements. Examination of a strip map shows plenty of color: red for airways, dotted blue for dry lakes, blue for water or sea level; green for land below 1,000 feet, and cream, buff, and brown for higher elevations. Some changes in the color scheme are being made by the Department of Commerce for 1946 maps.

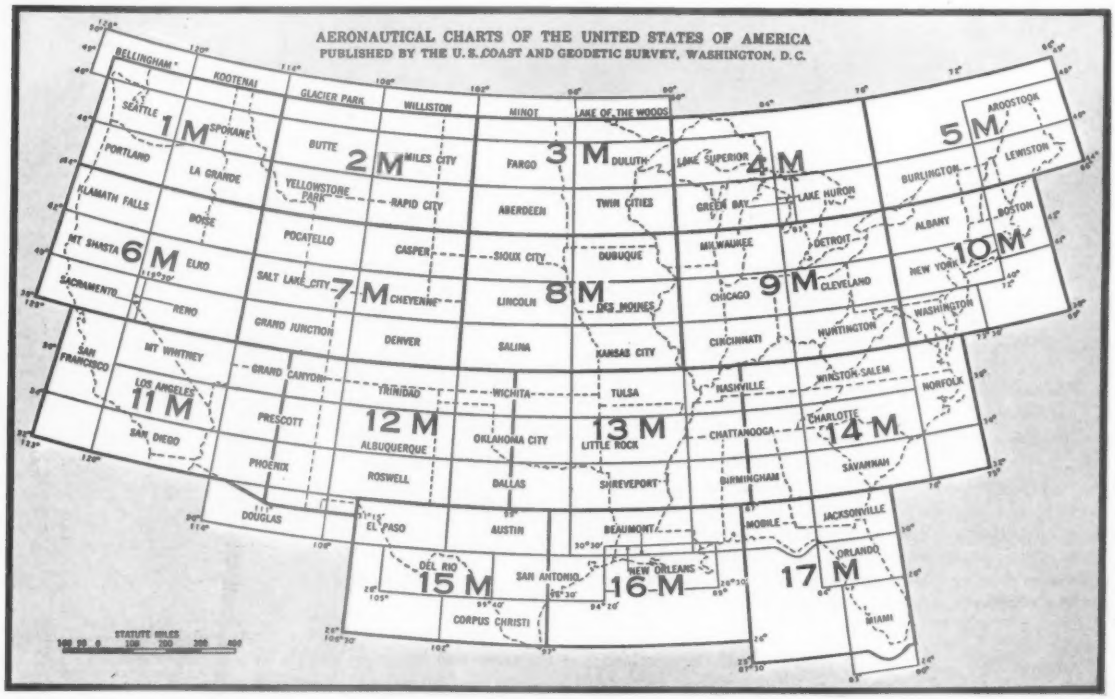
Water includes shoreline, lakes, dry lakes, rivers, and reservoirs. Land elevation is called "relief" and is shown by contour lines in addition to the color scheme. Shoreline is mean sea-level, or zero; raise the surface of the sea to 1,000 feet and the 1,000-foot contour line would be the new shoreline; 2,500 feet for the 2,500-foot line and so on.

Contours tell a pilot what mountains, valleys, and slopes look like. If the lines are close together, the mountain is steep; if the lines are circular with a sharp inward sweep, it is a round mountain with a valley; if the bulge is outward, it is a round mountain with a protruding slope. If there is a blue line in the valley, a stream flows down it.

Mountain elevation in feet is printed near the highest contour. The safest route across the area can be calculated by following the contours and estimating the least altitude needed for safe flight. This is valuable data for lightplane pilots who know how hard it is to climb over a mountain—and how easy to fly around it.

What man does to change the landscape

(*Continued on page 70*)



U. S. Coast and Geodetic Survey prepares U. S. charts. The map above shows the areas covered by the regional charts (heavy outlines) which cost 40 cents each, and by the sectional charts which cost 25 cents and are identified by main city in area.

THE AVIATION JOB OUTLOOK

Only a small proportion of trained flying personnel in the armed services can expect civil flying jobs.

This is a condensation of an article, "Post-war Employment Outlook in Aviation Occupations," which appeared in the June issue of the Monthly Labor Review of the U. S. Department of Labor.

TO many thousands of men in the military and Naval air forces who will be hunting civilian jobs, the employment outlook in aviation is a matter of immediate and urgent concern. It is also important to young people leaving school.

Post-war jobs for pilots and other skilled aviation personnel, although numerous, will be far too few to employ the tremendous numbers of veterans and others likely to seek work in aviation fields. There may be as many as 100,000 new jobs for pilots and other flight and technical ground personnel with the airlines and in non-scheduled air transportation and relative services by the fifth post-war year. Nevertheless, an oversupply of labor is to be expected in practically all aviation occupations. The surplus of qualified applicants will be much smaller, however, and the chances of finding work correspondingly greater in some types of work than in others.

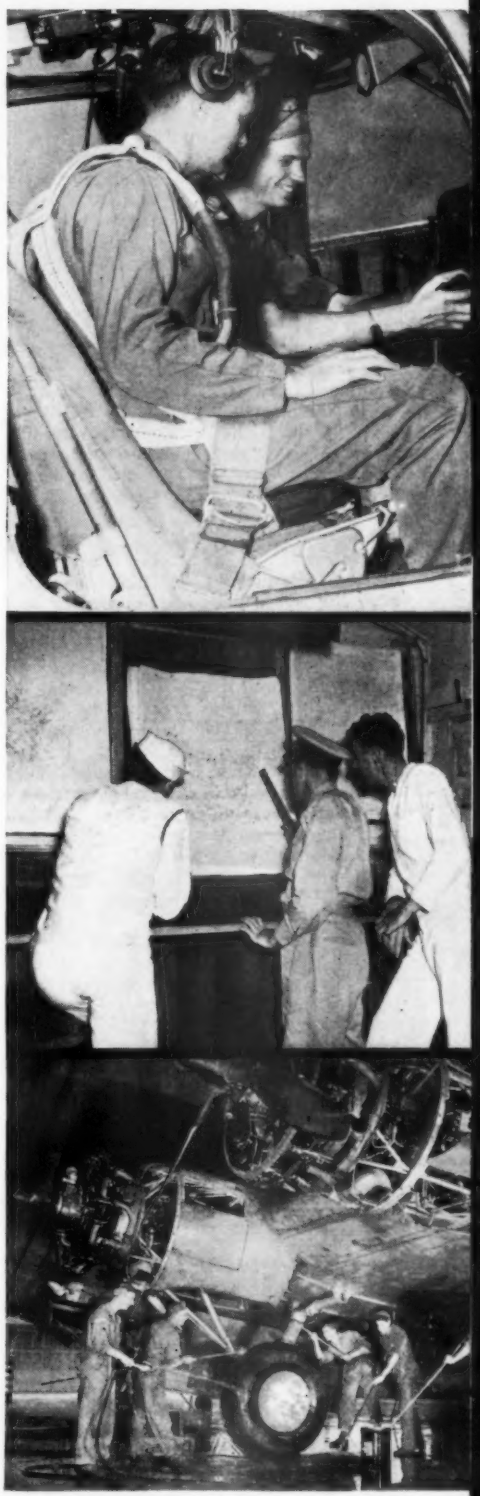
Airline traffic and employment are practically certain to rise rapidly now that the war is ended. Most carriers expect to make major additions to routes and schedules as soon as needed authorizations, aircraft and personnel can be obtained. By the fifth year (after V-day) as many as 15,000 pilots and co-pilots may be flying with the airlines—about 10,000 more than at present—according to a relatively optimistic forecast of air traffic.

Even a conservative view of the future of the industry suggests marked gains in employment of pilots and of some, though not all, other occupational groups. There also will be expanding job opportunities for pilots, aircraft mechanics and other technicians with non-scheduled flying services, flying schools and private companies using planes for business purposes, at airports and in Government agencies.

In general, the armed forces pilots best equipped for airline jobs are the 9,000 who fly the multi-engined transport aircraft with the Air Transport and Troop Carrier Commands, the Naval Air Transport Service, and other units. Many of these men now pilot military versions of present and future airline planes. Whether they have a good chance at post-war jobs in scheduled air transportation depends on whether the maximum estimate of 15,000 airline pilots and co-pilots by five years after the war proves to be correct. If it does, there should be openings for co-pilots for most qualified applicants with multi-engined transport experience fairly soon after their demobilization.

However, the airlines place great emphasis on the education and personal characteristics of prospective co-pilots as well as on the nature of the applicant's flying experience. At the present time they are hiring mainly bomber pilots since comparatively few transport pilots are being released from the armed forces. This situation will continue until greater numbers of transport pilots are available.

The best chance of flying jobs for the 180,000 to 190,000 pilots with multi-engined transport ratings will be with non-scheduled commercial aviation. The number of men seeking such jobs is



Pilots trained for multi-engined transports (top) have best chances for jobs. Jobs like meteorologists (center) and maintenance men (lower photo) will be proportionately fewer.

likely to be several times greater than the available opportunities, however, despite the prospect that many pilots will want other types of work. An optimistic figure on expansion in employment of pilots outside the airlines by five years after the war is 22,000, including men who start their own small flying businesses and these opportunities will develop gradually over the period.

Employment opportunities for aircraft and engine mechanics, radio technicians, and other maintenance specialists will also be small relative to the trained labor supply. The maximum number of new jobs expected in such maintenance occupations by the fifth post-war year, both with airlines and in other fields, is only 49,000. In contrast, enlisted aviation mechanics and maintenance specialists now total about 570,000, of whom at least 85,000 (15 per cent) count on post-war aviation jobs, according to sample studies made by the War Department. Others trained in aircraft maintenance work who may seek such employment are 100,000 civilian employees of the Army and Navy air forces and of aircraft factories.

Men seeking jobs as flight engineers, navigators, flight or ground radio operators, dispatchers, or meteorologists after the war will be handicapped by an even greater oversupply of labor. New jobs of these types are not likely to exceed 9,500 in all aviation industries during the first five post-war years, a figure only 1/25th as great as the number of men (235,000) with comparable duties now in the armed forces. On the other hand, in some occupations studied —airline steward and aviation stock clerk —the labor surplus is likely to be less and job opportunities mav therefore be much better for qualified and experienced applicants.

The following sections briefly discuss each of these fields.

FIXED-BASE OPERATIONS: The activities of fixed-base operators include non-scheduled transport of passengers, freight or both in charter, taxi, ferry and sightseeing flights; instruction of student pilots; and special flight services such as aerial photography and surveying, skywriting and other forms of aerial advertising, crop-dusting and spraying from the air, and forest and other patrol flights. In addition, many operators offer services comparable to those of an automobile garage, renting storage space in hangars, selling oil, gasoline, and repair parts, and doing maintenance and repair work. Before the war a considerable number also had sales agencies for light pleasure-type planes and they will no doubt resume this arrangement after the drastic wartime restrictions on production of civilian aircraft have been listed.

A renewed upward trend is already in evidence in charter operations, which now number about 500, as they did in 1940. The trend is expected to continue.

A new and large potential source of traffic, both for established operators and for newcomers who may wish to enter the field, is the contract transportation of perishable fruits, vegetables and other cargo. The prospective expansion in scheduled air transport should tend to generate greater demand for taxi flights rather than to cut into nonscheduled business, except as there may be a development of scheduled local feeder lines reaching many additional communities directly. The chairman of the Civil Aeronautics Board has suggested that charter operators may play an important role in providing air service in localities not yet able to support regular feeder lines. In his opinion, nonscheduled transport operations were only at the beginning of their growth before the war and may well number 2,000 or 3,000 within a few years afterward, as compared with only about 500 in 1940.

For operators offering specialized flying services, an expansion in activities is also in sight—though the rate of growth may be less than that suggested for charter operations. The long list of pre-war commercial users of aircraft will no doubt be lengthened with the use of recent developments in photographic and mapping devices and other wartime technical advances. In addition, flight instruction is likely to have a renewed growth, especially if Congress authorizes a revival of the CAA Civilian Pilot Training Program. Already there has been some increase in enrollment of civilians in flying schools which have ended their training of armed force pilots.

Operators with facilities for storing, servicing and renting private planes and with sales agencies for light aircraft should likewise have marked gains in business. The probable size of these increases is very uncertain, however, since the answer depends on the much-debated outlook for private flying. Estimates of the CAA, which are relatively optimistic though not the highest that have been made, set the total number of civilian aircraft likely to be in service five years after the war at 110,000 and 10 years after, at 425,000. On the other hand, some of the forecasts of aircraft sales suggest a total of no more than 75,000 planes, and perhaps considerably less, by the fifth post-war year.

AIRPORTS: Although airports are the base of all aviation operations, they have comparatively few technical employees of their own. Many workers stationed there are on the staffs of airlines, fixed-base operators or concessions and some may be employees of the CAA, the Weather Bureau, or various departments of the city government.

In 1940 there were 2,331 airports and landing fields in this country, consisting mainly of municipal and commercial airports but also of CAA intermediate, military, Naval, and private fields. Since then, the total number of airports has risen by more than 50 per cent but most of the net gain has been in Army and Navy fields. More than four-fifths of the civilian fields are small, able to accommodate only private-owner or feeder-type planes.

The importance of airport size, for the purposes of this study, is of course its relation to personnel requirements. Information on the occupational distribution of airport employees is scanty. Where there is a traffic control tower, the largest group of technical personnel is likely to be the traffic control staff, which averages about eight operators per tower for 24-hour and about three or four for part-time operations.

Some 110 or 115 airports in this coun-

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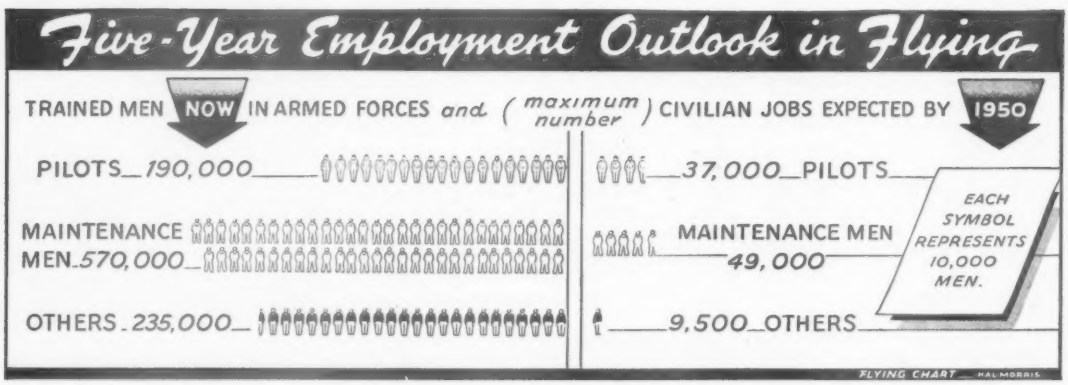
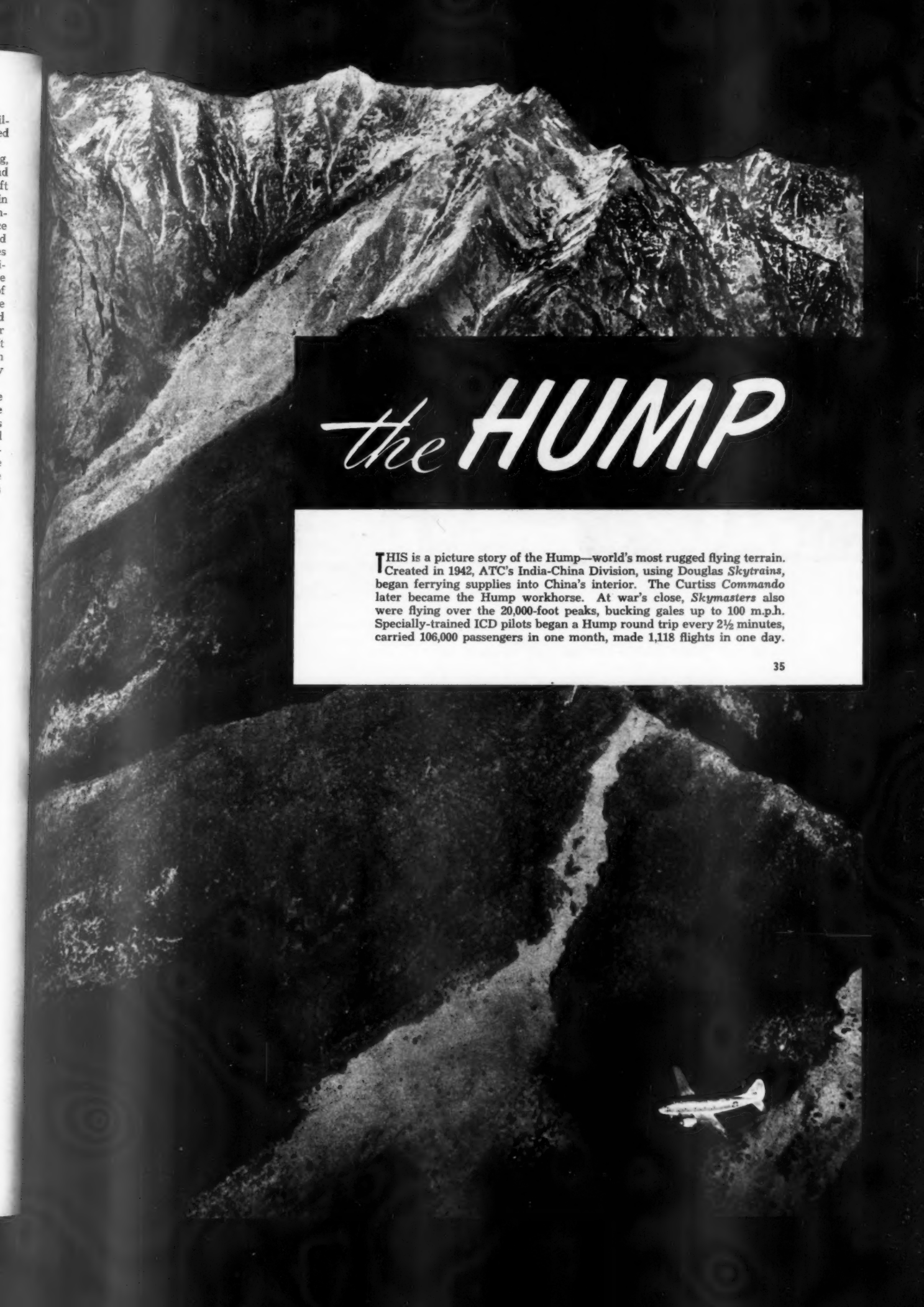
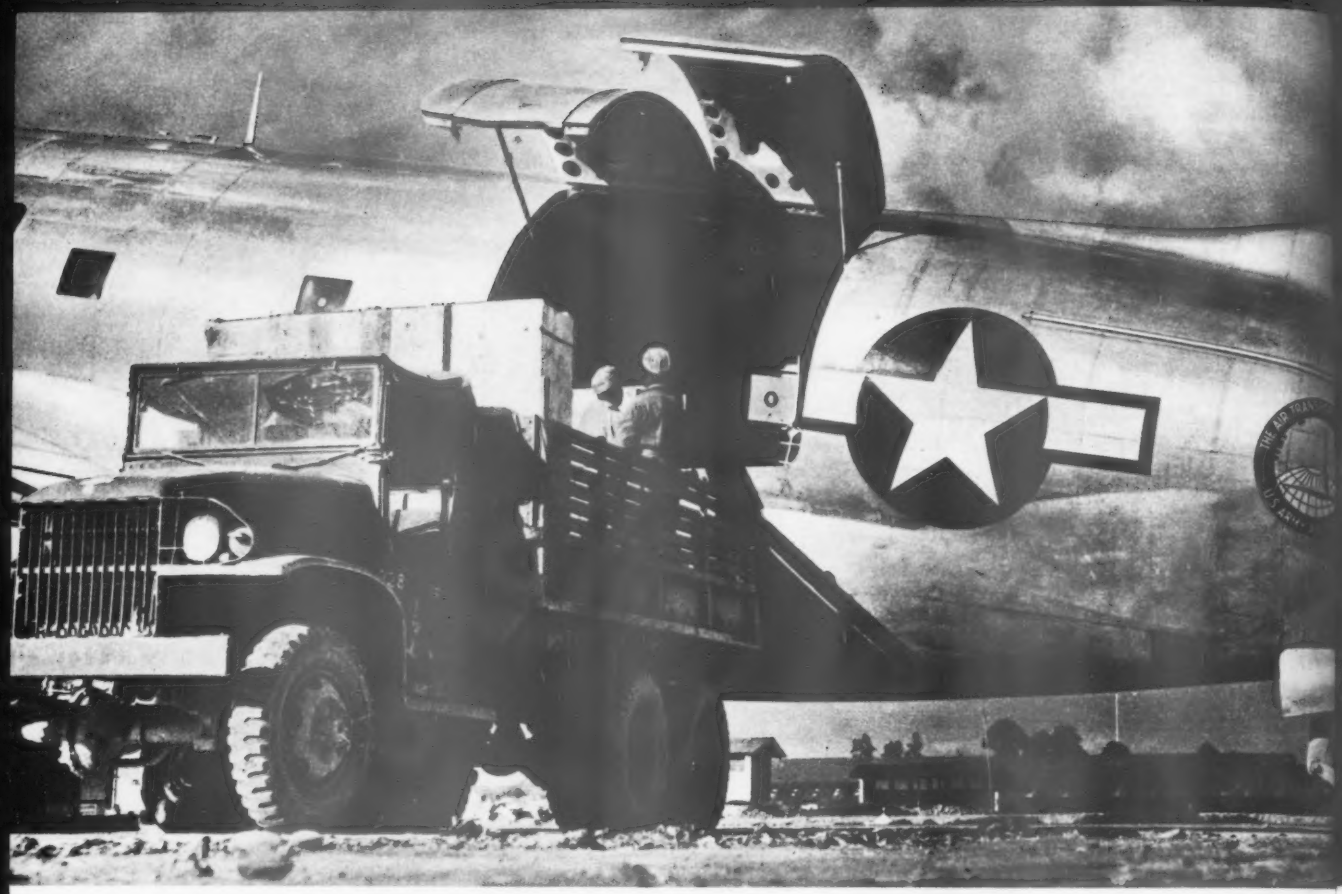


This chart, indicating the ratio between trained personnel from the military forces and the expected number of jobs in civil aviation by 1950, does not include young people still in school who will seek aviation jobs after graduation.



the HUMP

THIS is a picture story of the Hump—world's most rugged flying terrain. Created in 1942, ATC's India-China Division, using Douglas *Skytrains*, began ferrying supplies into China's interior. The Curtiss *Commando* later became the Hump workhorse. At war's close, *Skymasters* also were flying over the 20,000-foot peaks, bucking gales up to 100 m.p.h. Specially-trained ICD pilots began a Hump round trip every 2½ minutes, carried 106,000 passengers in one month, made 1,118 flights in one day.



Loading a Curtiss Commando (above). Aircraft moved such loads a hundred times faster than trucks were able to carry them over the Burma Road. Hump planes flew 5,327 tons in one outstanding day.

Crossing the Salween river valley (below) on an unusually clear day. Here is generated some of the most turbulent flying weather in the world. The C-46 was the main Hump air transport at the war's end.

Desce
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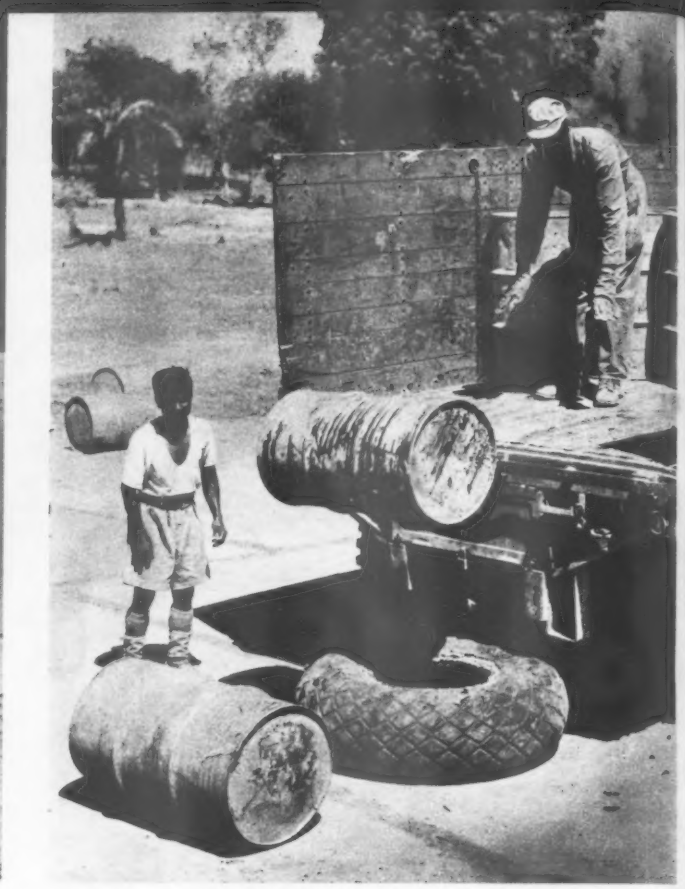
Comm

Descending over a Chinese lake (above) after crossing Hump. In one month 46,000,000 pounds of cargo flew over this route. A single Commando flew 27 days one month, averaging two Hump trips a day.

Loaded Commando lands at its China terminal. Runways on such fields were hand-made by coolies (below). These planes carry everything from bullets to 10-ton trucks. Man at right is an AAF pilot.

An Army pilot, at Chinese base after Hump flight, lights a cigarette for coolie (above). Note sign on operations office: "You Made It Again—Good Work." Hump safety record is good.



Drums of gasoline are unloaded at ATC base in India for shipment over Hump (above). Meanwhile, Commando's 2,000-h.p. Pratt & Whitney engines get exhaustive checks (below) before each flight.

Air Schooling for Milady

In Aeronca Super Chief, Joanne Wilson, New York City, records another hour in her log book while Phyllis Thompson, Birmingham, N. Y., looks on. Eighty Stephens students take flight instruction each semester, hundreds of others get "flight experience."

Marion Peters of Lake Forest, Ill., typifies Stephens pilots.

By ARLENE SHOEMAKER

AT THE Columbia, Mo., Municipal Airport at 90-minute intervals on most any weekday, groups of a dozen or so girls hop out of a college bus and into the hangar. They wear flying suits, blue jeans, slacks or riding clothes and carry notebooks like any typical American college girl. Each girl dons a parachute and goes to the ready room to speak with her instructor about the day's work in the air. Together, instructor and student chart a flight problem on paper and analyze the performance of the previous day.

These are students of Stephens College at Columbia, where aviation in all its phases is being studied by some 2,200 young women along with their Latin, chemistry and psychology.

Four years ago Stephens started the first course of its kind ever offered in an American girl's college. From the several dozen girls who sat in the aviation orientation course in the fall of 1941 has come the present program in which more than 800 are taking an active part.

The Stephens College administration envisions the day when a class in American Government will fly to Washington

to see the Senate in action or drama students will find themselves on Broadway for their laboratory work. The annual spring educational trips formerly taken by train may now be made by airplane.

Because only 80 students can take actual flight lessons each semester at present, a new "flight experience" program has started for those several hundred girls studying airline procedure or some phase of ground school work. Now that the war is over, Stephens plans to make available, without extra cost, flight experience to every student on the campus.

This past year, flight experience has been made a laboratory requirement for students in airline procedure classes and elementary aeronautics. Elementary aeronautics students are taken on a three-hour cross-country flight. Each airline procedure student is taken on a flight to the Kansas City airport where she visits and studies the facilities of the TWA flight offices. The students are required to observe the principles of flight, study air regulations and learn to dispatch a flight in the TWA offices. Thus, a girl studying ticketing and reservations will have a much clearer idea of her job after being graduated from Stephens.

The results of Stephens' aviation program can be found in many of the airline offices today. Approximately 200 Stephens College graduates have been employed in the past three years as per-

Stephens aviation students eat, talk and sleep flying. Instructor Nancy Corrigan explains air maneuver to Jeanne Coffey, Middletown, O.

A group of Stephens students gets familiarization course in engines. Lab equipment at the college ranges from 65-h.p. to 1,250-h.p. engines. Other ground school equipment includes aeronautical instruments, sub-assemblies, and grounded aircraft.

Kenneth E. Newland, head of Stephens College Aviation Department, explains how to lay out a cross-country flight on aeronautical chart. In background is the Skylanes tearoom on aviation campus at Columbia Airport. Aviation students commute from airport dorm to other classes.

After a cold flight in one of Stephens' Fairchild M-62 trainers, Jeanne Wilson leaves field with instructor for the hangar ready room where her performance will be analyzed and her "classroom" flight studied. Advanced students can fly enough to obtain commercial and instructors' licenses.

Airline procedure students fly to Kansas City for "flight experience," then study air regulations and learn to dispatch flights from the TWA flight offices there.

sonnel workers, meteorologists, Link Trainer operators, ticket clerks, reservationists, control tower operators, and in other similar positions with airline companies.

In addition to the actual flight program, courses in the aviation department cover general traffic operations, communications, maintenance, sales, passenger service, meteorology, navigation, mechanics, geography and map drawing. The instructors are teaching the girls from a layman's viewpoint, stressing the practical side of aviation with emphasis on safety and utility.

For those students who wish to prepare for a specific vocation during their two years at Stephens College, training for the following positions is given: airlines traffic employee, trainee traffic controller for airways and airports, flight instructor, drafting and blue print reader, engineering draftsman, junior aircraft communicator, meteorologist or junior weather observer. Various airline companies, branches of the armed services, and the Civil Aeronautics Administration have employed several hundred Stephens graduates since the course was originated.

The girls start flight training gradually, beginning with a 40-minute period of dual instruction. Most fly from eight to 12 hours before their first solo flight. After a girl receives her private pilot's license she may take advanced work for

(*Continued on page* 112)

With Instructor Margaret Wakefield, Gladys Boagni of Opelousas, La., watches classmate take off at Stephens College's "aviation campus." Equipment here consists of 18 planes, including 14 Aeronca side-by-side trainers, three Fairchilds and a four-passenger Beechcraft.

By FRANKLIN D. WALKER

THE engineering genius that produced the *Shooting Star*, most powerful jet plane ever devised, now is rumored to have developed an atomic "ionosphere" fighter which, through the combination of jet power and wing airfoil improvements, may solve the problem of compressibility (air resistance) encountered when planes approach the speed of sound (763 m.p.h. at sea level). Such a plane would be capable of reaching velocities in excess of 1,000 m.p.h.

Whether the new fighter has overcome the compressibility obstacle can not be verified but its immediate predecessor, the *Shooting Star*, has flown above the 550-m.p.h. mark, where air resistance begins to become a major problem, and it may be that data thus obtained, plus facts assembled from wind tunnel tests, has opened the door to supersonic flight which is unaffected by serious air drag.

Two other developments point in the direction of air speeds of 1,000 m.p.h. or higher. One is the new electric flying suit for use at altitudes in the neighborhood of 80,000 feet; the other is the NACA announcement of plans for a 2,000-m.p.h. wind tunnel.

Reports of the "ionosphere" fighter coincided with the new concept of aerial warfare outlined so forcefully by Gen. H. H. Arnold, commanding general of the U.S. Army Air Forces, at his most recent (perhaps his last) press conference.

He listed the following developments that "are probable to the point, almost, of inevitability":

1. Manned or pilotless aircraft traveling at supersonic speeds, sending to oblivion conventional fighters and bombers.

2. Guided missiles with controls so refined that exact hits can be made on targets of a mile square or less, at any part of the world, from any part of the world.

3. Improved atomic bombs which could destroy overnight all of any country's major cities.

4. Target-seeking antiaircraft rocket missiles which search the stratosphere or the ionosphere (50 miles above the earth) to destroy the enemy's supersonic planes and guided bombs.

5. Perfected communications systems between air and ground, making possible the most intricate maneuvers either by piloted planes or pilotless missiles.

6. Extraordinary development of the techniques of launching, landing and supplying airborne forces who can be dropped completely equipped at any point in the world in a matter of hours.

He declared that our V-2 type rocket bombs can now be drawn to targets by their reaction to metal, to light or to heat and that tests have proved a bomb can be guided by television installed in a plane many miles away.

In the field of rockets, particularly those utilizing liquid fuels, the United States is said to have built a rocket bomb that surpasses in every respect the performance of the famed German V-2. The V-2 reached speeds above 1,500 m.p.h. and altitudes above 60 miles.

Once the special province of the visionary and his first cousin, the imaginative pulp magazine writer, this other world of atomic and rocket power and jet propulsion, coupled with radar and radio, has become the actual realm of applied military research that already has produced tangible results.

One remark by General Arnold that was not generally recorded by the working press is significant. When a reporter asked whether the Allies would continue their close relationship in future developments of military instruments General Arnold said: "I think it is about time we threw a tent over what we are doing."

Boundary Layer Control

One phase of airplane development currently occupying the mind of John Geisse, assistant to the CAA administrator, is boundary layer control—the control of turbulent air over the upper wing surfaces. The problem is one of disposing of turbulent air which builds up on the wing surfaces and breaks away, destroying lift and causing stalls. A workable control device on a wing with a lift coefficient of, say, 1.5 might possibly increase the figure to six. Increasing lift coefficient of a plane by four would decrease minimum speed by about 50 per cent, Geisse believes. In other words, boundary layer control on a plane with a minimum speed of 50 m.p.h. and a maximum speed of 120 m.p.h. would, theoretically, lower the minimum to 25 m.p.h. It would have no effect on the maximum speed. Geisse suggests that a slot one inch wide running from fuselage to wing tip, with the manifold serving as the pump to draw off the air, possibly could be a solution. The same effect might be obtained by placing several small propellers on each panel. A drawing of such a plane illustrated Geisse's article, "Before I Buy a Plane," in the February, 1945, issue of FLYING. United Air Lines experimented with boundary layer control several years ago and the Navy delved into the subject during the war. A small plane built by the Army to test the boundary layer control theories of a midwest college professor is reported to have been built a year or two ago. The Germans began research on boundary control but dropped it.

Who's Your Candidate?

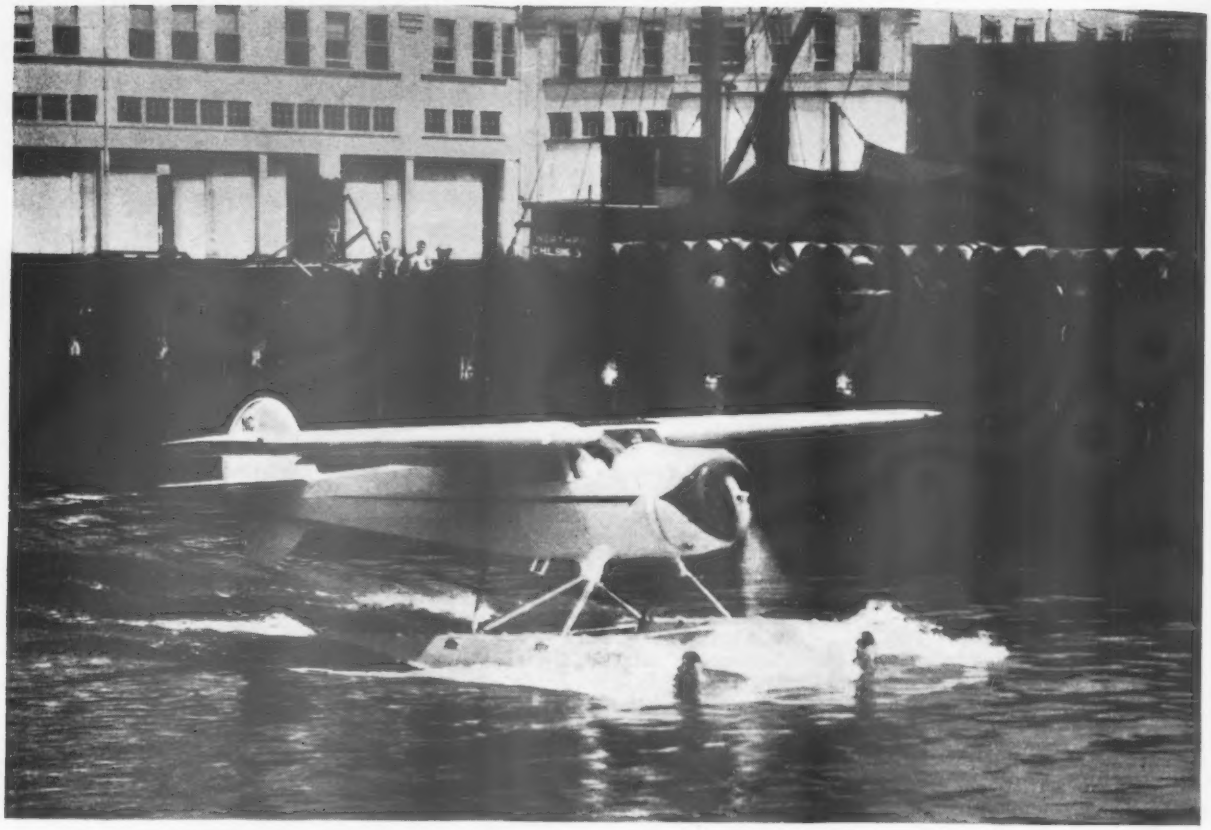
The man without a candidate for the vacancy created by the resignation of Dr. Edward Warner, vice chairman of the Civil Aeronautics Board, is rare in Washington. Since Dr. Warner accepted the presidency of the Provisional International Civil Aviation Organization in Montreal, discussion of his successor at CAB has been a major topic of conversation. Those mentioned most frequently include Charles I. Stanton, Col. Harold Hartney, S. Paul Johnston, J. Parker Van Zandt, John Colvin, John Chamberlain and Grover Loening. Stanton is reported to have been offered the job after Dr. Warner decided to accept the $25,000 PICAO post, but before announcement of his acceptance was made. Stanton refused to consider it until the vacancy actually existed, his friends say. Present members of the Board are said to have indicated they would like a voice in determining who shall be appointed to the vacancy.

Non-Stop Coast-to-Coast

The performance of two transcontinental, non-stop airlines, both sponsored by the Air Transport Command to aid in the redeployment of troops, is being watched carefully by domestic air carriers. One of the lines, between Hamilton Field at San Francisco and Washington National Airport, is operated by TWA; the other line is flown by Pan American between San Francisco and Newark, N. J., airport. Both lines are using Lockheed *Constellations* (C-69's). TWA reports its best time on the 2,500-mile route has been 8 hr. 37 min., an average of 289 m.p.h. Harold F. Blackburn, manager of TWA's Intercontinental Division, recently flew a *Constellation* from Washington to Burbank, Calif., on three engines.

Pan Am's withdrawal from an ATC

(*Continued on page* 102)



This Cessna Airmaster must be "sailed" as long as it rests on its floats, requiring of its pilot an entirely different handling technique from that of land-based version. Note added fin under rudder.

Handling the SEAPLANE

For safe operation of water-based aircraft, the private pilot must have a thorough knowledge of elementary sailing.

By
GEORGE B. POST

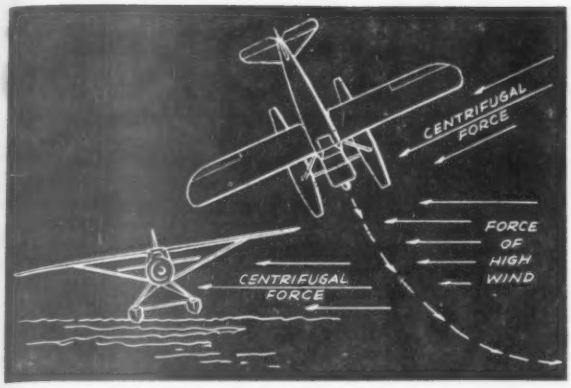
The author, a recognized authority on seaplanes, is vice president of the Edo Aircraft Corp., College Point, L.I., N. Y., pioneer manufacturers of aircraft floats. He has been a pilot since 1918 and has been with Edo since 1928, also having served as that company's test pilot. He served in the Navy in World War I, and still is a member of the Naval Reserve.

PART ONE

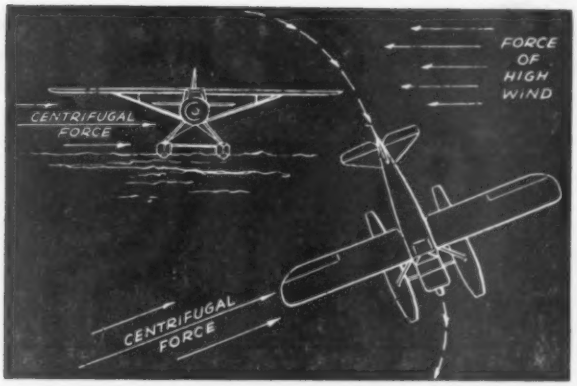
SEVERAL fundamental characteristics form the basis for the wide differences between handling a landplane and a seaplane. On the ground, with motor idling, the landplane remains inanimate, in a fixed position, whereas the seaplane under identical conditions on the water moves along a path which may be the resultant of a number of different forces.

Any normal seaplane which is floating free, its engine dead or idling, will "weathercock" or turn like a weather vane, so that its nose is pointing upwind. In this position it will creep forward or drift backward, depending upon the relative effectiveness of its propeller thrust and the velocity of the wind and water currents. Furthermore, it will require at least an appreciable propeller blast to put it or hold it on any other than an upwind course, with still additional power required to make a complete turn downwind.

Before taking out a seaplane, therefore, the pilot should always look over the prevailing conditions in advance, with an eye to determining what the plane is likely to do. If wind and water currents



When taxiing a seaplane, consideration must be given the combined effect of a high wind force and the centrifugal force. Use of power when making a fast turn into the wind, as shown above, will create a dangerous capsizing tendency.



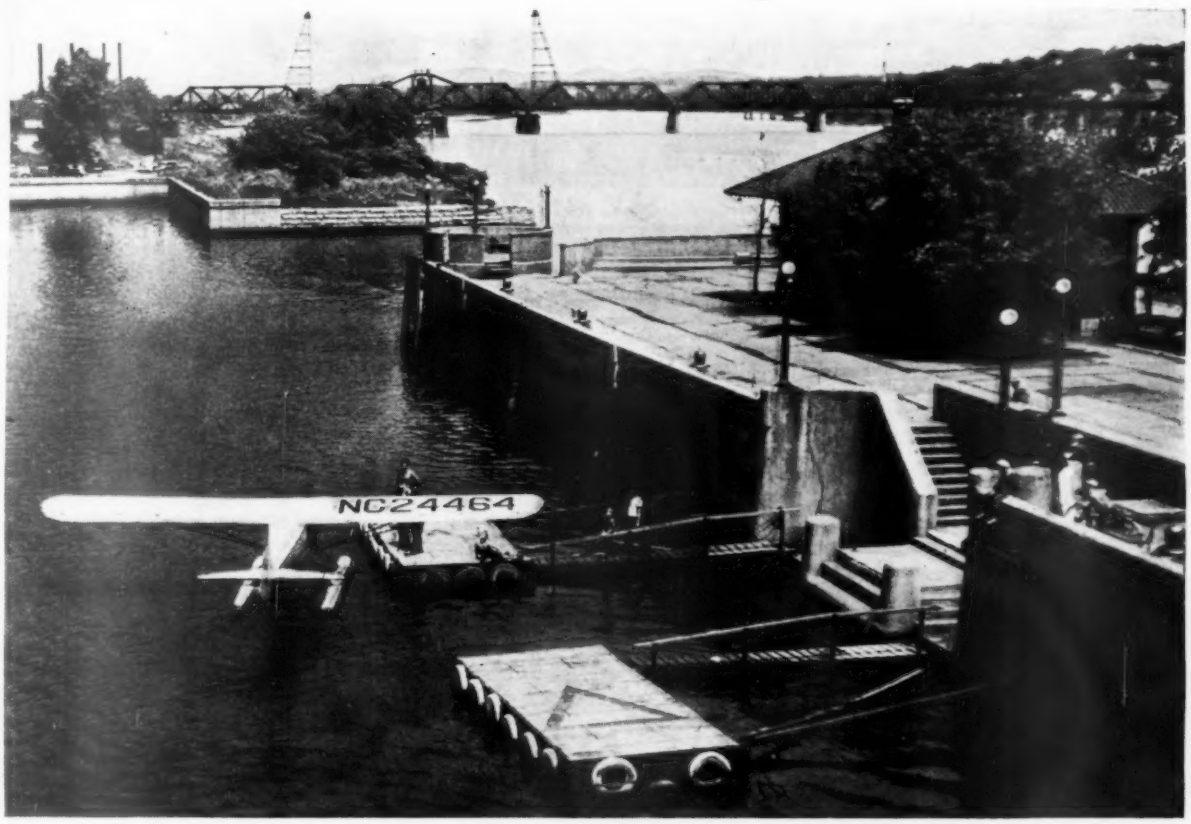
Making a fast turn out of the wind will permit use of power when taxiing a seaplane since the capsizing tendency is cancelled by the centrifugal force and the high wind which act against each other, tending to keep plane on level keel.

are light and the take-off area and approaches to the base are wide, open, and free from large waves, there is little to consider. But if not, it is advisable to consider carefully the taxiing problem before getting underway.

Probably one of the most important taxiing rules to remember is that the pilot ought to hold the stick all the way back all the time the plane is on the water. The only normal exception is that of actual take-off or when the ship is taxied at speed with considerable power. Under normal conditions the stick must be held back to lift the nose, reduce spray on the propeller and improve maneuverability. This one point, I believe, is the one on which the average landplane pilot most often goes wrong when making his first flights from water, because it is directly contrary to what he has learned in landplane practice.

It is always well to taxi along as slowly as possible unless there is a long distance to cover and conditions are suitable for running the craft at speed, more or less on the step. Careful taxiing will reduce spray on the propeller. At idling speed the propeller does not pick up spray even though waves may be breaking right over the floats. As the throttle is opened and the plane picks up speed, however, spray

(*Continued on page* 92)



This Cub floatplane illustrates how to approach a dock. Unless the approach is directly into the wind, always allow plenty of room, head plane to leeward so it can weathercock around and then idle along toward dock, making contact on an up-wind course.

OCCLUDED FRONTS

EDITOR'S NOTE

This is a condensation of the Navy booklet entitled "Occluded Fronts," prepared by the Training Division, Bureau of Aeronautics. It is No. 7 in the Navy's aerology series, reprinted here because of its brief, simple, lucid treatment of weather.

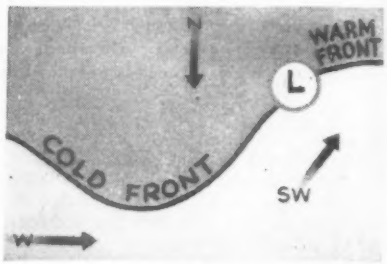
Having all the problems of a warm front and a cold front, the occluded front is double trouble.

TO DEFINE and explain the characteristics of an occluded front, it would be well first to define the word "occlusion" as applied to aerology. An occlusion is the shutting in, or out, of something—as you would shut out light by lowering a shade or closing off a passageway by closing a door. An occluded front occurs in the atmosphere when a cold front overtakes a warm front and one or the other is lifted aloft so that the warm air between the two fronts is shut off from the surface of the earth. Hence it is "occluded."

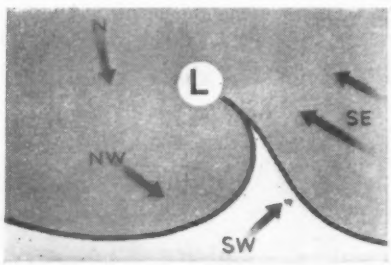
The occluded front is formed during the life cycle of a cyclone, which is a traveling system of winds that, in the northern hemisphere rotates counter-clockwise around a center of low atmospheric pressure, with the reverse being true in the southern hemisphere. The term cyclone should not be confused with the type of weather brought to mind by the words "hurricane" and "tornado." In order to understand occluded fronts it is necessary to know something about the cyclone—not the technical knowledge of the aerologist but enough to grasp its significance to a pilot.

Cyclones are like people in that they are born, they grow to maturity and they die. The birth of a cyclone occurs in the polar region which is occupied by the cold heavy air which produces pressure. The polar front acts as a barrier separating this polar air from the warmer tropical air of the middle latitudes. North of this front the winds are easterlies while those in the middle latitudes are westerlies.

As tropical air from the equator is heated it rises and moves toward the North Pole at high levels and piles up behind the polar front. Air cannot blow through the polar front, so when the pressure behind it becomes sufficiently great it is forced to move. A small section of it bulges out into the westerly wind stream of the middle latitudes. When this occurs, the westerlies are deflected and become southwesterlies, causing an adjacent sector of the polar front to retreat toward the north. The result is a southward surge of cold air and a

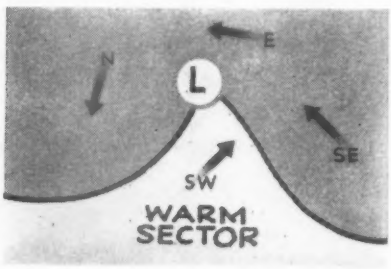


Warm, cold front joining forms low area.

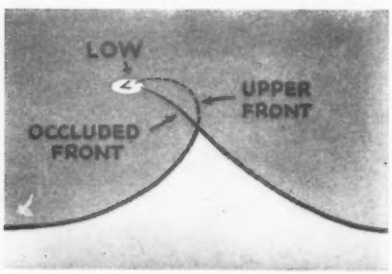


Cold front winds generally are easterly.

An occlusion results from cold air overtaking warm air. Whichever remains at surface denotes the type of occlusion—warm front occlusion or cold front occlusion.



Warm front narrows as cold air moves in.



This warm front occlusion shows cold front has overtaken and risen over the warm front.

northward surge of warm air, causing an apparent counter-clockwise rotation, something like an eddy in a pool of water. Thus a cyclone is born.

As the bulge in the polar barrier continues south, it rides under and displaces the warmer air ahead of it, forming a cold front. (See the July issue of FLYING.) As the warm air from the south moves northward it replaces the receding cold air, forming a warm front. (See June issue of FLYING.) The warm air being lifted causes a center of low atmospheric pressure to form at the intersection of the cold and warm front. As more and more of the warm air flows up over the warm front, the center of lowest pressure moves in the direction of the warm air current. Thus the southwesterly winds of the northern hemisphere cyclone impel the cyclone to move in an eastward direction.

It is characteristic of a cold front that it moves more rapidly than a warm front and thus, as the cyclone continues on its way, the cold front gradually overtakes the warm front.

Obviously, the surface of the earth does not have a constant temperature over a widespread area and, since the earth's divergent temperatures act upon both, the cold air behind the cold front rarely has the same temperature as the cold air ahead of the warm front. Consequently, when one front overtakes the other, the warmer and lighter mass of air gives way to the colder and heavier mass and is forced aloft. This process, in which the warm air is shut off from the surface of the earth, is called an occlusion.

There are two types of occlusions and which one of them occurs in any particular cyclone depends upon the temperature distribution in the mass of cold air that lies to the *north* of the two fronts. When the air behind the cold front is colder than the air ahead of the warm front, the cold front pushes in under the warm front. The cold front remains at the earth's surface and the resulting occlusion is called the cold front type. Sometimes, however, the cold air ahead of the warm front is of a lower temperature than the air behind the cold front. When this happens, the cold front rides up over the warm front, and the occlusion is known as the warm front type.

The front which remains at the surface is the "occluded front." The front which is raised aloft is the "upper front" of the system, and is the one of primary importance to aviation because it is held aloft where it is a danger along the pilot's flight path. *It is difficult to locate on the weather map and impossible to identify from an airplane.*

In an occlusion you have a combination of the hazards of a cold front and a warm front working together against you —a warm front at the earth's surface and a cold front above that. An important thing to remember is this: The most violent phase of the occlusion from the pilot's standpoint is in the early stages of the cyclone, because at this time the weather along the upper front is raising cain.

In the latter stages of the cyclone, when

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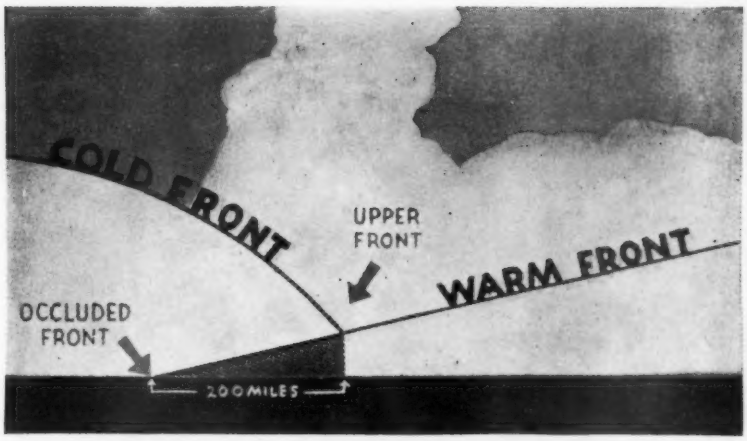
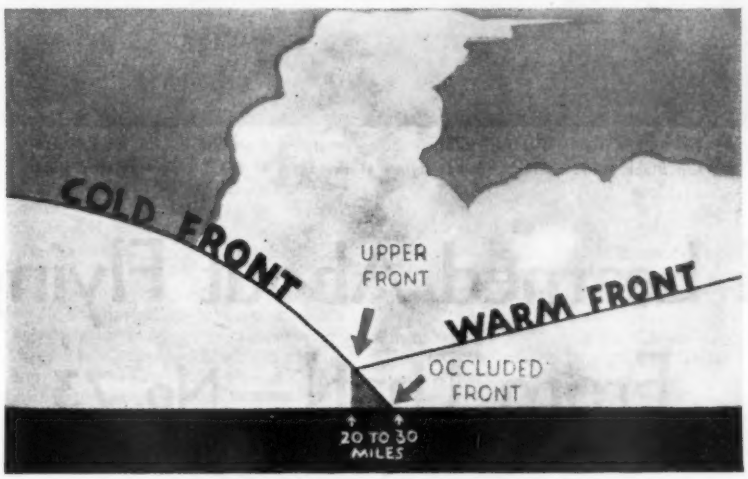
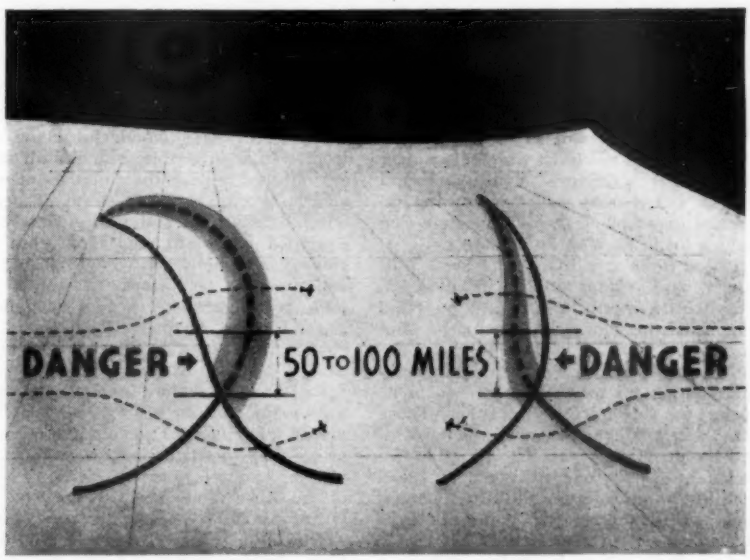


In warm front occlusion, the upper front precedes the surface, or occluded front by as much as 200 miles. Note that cold air has slid up over warm front wedge.



Cold front occlusion differs from warm front type in that upper front follows occluded front by 20 to 30 miles. Here warm air is raised as cold air moves in.



If a weather map shows an occluded front in your path, plan your flight to avoid the danger zone, which extends from 50 to 100 miles north of the warm sector peak.

The author, well-known test pilot, is shown emerging from the cockpit of a Northrop Black Widow which he was flying at the time of the incident related here.

I Learned About Flying From That!—No. 73

By ALEX PAPANA

Vice-president, Aircraft Testing Co.

When a gas gauge lies—and they can—look out!

WHEN the gas gauge indicates that 50 per cent of the fuel has been used, the optimist pilot will say: "My tank is half full." The pessimist worriedly notes: "My tank is half empty." This may sound foolish, but it does serve to indicate important psychological differences which have a lot to do with flying safety.

I used to be an optimist of a sort. I always trusted my instruments 100 per cent. Then, little by little, I found out that among all the gadgets with which a pilot has to be familiar nowadays, there are only two which are consistently dependable—and even this statement has to be made with certain reserve motions. Those two instruments are the turn and bank indicator, and the compass. All other instruments, like temperature gauges, speed or altitude indicators, radios, fuel gauges, etc., happen to mislead you once in a while—especially fuel gauges.

And that's where I ran into trouble a short time ago just because, on this one occasion, I trusted mine a bit too much.

I was working as an engineering test pilot on a twin-engined Northrop *Black Widow*. It was a wonderful plane, extremely maneuverable, but like all modern military craft, rather unpleasant once you lost your power because of heavy wing loading. The standard models were equipped with four fuel tanks, but the particular plane which we were using for experimental test work had only two tanks which carried just over 400 gallons, 200 for each engine. Considering the power these engines develop, 2,000 h.p. each, 400 gallons is really not so much.

Full throttle is not used all the time, but on some of our tests we were pulling plenty of power. This did not give us much time for flight test work—actually we were limited to about one hour. Some of the pilots landed on several occasions with only 20 or 30 gallons of fuel left.

The day I ran into trouble was on a 13th. As you will see, I was not superstitious, probably never will be. Anyway, we took off, two engineers and myself, exactly at noon. The sun was bright, the ocean blue, and the engines were running like a dream.

It was one of those flights when everything seems so easy that you wonder why you ever get paid. We made several runs at 10- and 15,000-feet altitudes. Knowing that I had little gas left, I planned the last run so it would bring us back to the vicinity of the airport. This was not always so simple, because this plane cruised at approximately 300 m.p.h., and also because flight test engineers who ride with you want the sun kept at a certain angle and ask that you do not change your course for 15 or 20 minutes. Nor will they permit you to bank the plane more than 7.5°.

After about 45 minutes we at last finished our test flight and I was casually heading for home, approximately 30 miles away. I looked again at the fuel gauges. They indicated 35 gallons, in the left tank and 30 in the right one, the usual amount of gas one might expect to have after such a flight, so I never gave it a second thought. Our altitude was 2,000 feet.

I made a radio contact with our tower, giving position, altitude and expected landing time. Exactly 55 minutes after take-off we were still at 2,000 feet, five miles from our home field and approximately one mile away from another airport. I was getting ready to lower my landing gear when suddenly the left engine sputtered and then quit. I glanced at the fuel gages. They were indicating 30 and 25 respectively, but the left fuel pressure had dropped and no warning lights had gone on. I immediately turned the cross-feed valve on, so that both engines would be fed from the right tank. Just as I was going to shut off the left gas tank and feather the left engine, the right engine sputtered and then quit too.

It was the silliest situation in which a pilot can ever expect to find himself—completely out of gas, almost over an airport, but in an awkward position for a landing. I was too near and high for a straight approach and too low to turn away and back again. To make it worse, we were going to have to try to approach the field over some factories and high tension wires.

I knew we were in a tight spot, but I was confident we would get out of it all right, because I could almost touch the field with my fingertips. I didn't want to lose the plane, so the first thing I did was to put the landing gear down. This used all the hydraulic pressure available, I started a timid 90° left turn. The field was large enough, but there were those obstructions to bypass.

First of all, the traffic tower was exactly in my way, standing there like an Egyptian pyramid. I could not afford any more turns if we were to make the field. I used to be pretty fair at dead stick landings, dropping the plane almost on a dime. But these heavy babies have an angle of descent with dead engines which is not far from 45°. I pulled back on the stick, as much as was safe, praying that the tower operator would duck if necessary.

We cleared the tower, but that was only the beginning. We had no flaps as there

(*Continued on page* 104)

By Maj. OLIVER STEWART

British Authority, Editor of Aeronautics

EVER since the launching of the first atomic bombs on Hiroshima on August 6 and on Nagasaki on August 9, discussions have been going on in Britain's Royal Air Force on future weapon policy. If the atomic bomb were always to be launched by an ordinary aircraft, the problem becomes one of quick and certain interception.

In that event, Britain's best defence against any future attacker would again be intercepter fighters and radar—but fighters of much higher speed and climb capabilities than any yet built. But if it were possible to launch atomic bombs as the warheads of rockets, the intercepter fighter could provide no **defense** and the whole structure of air force equipment would need fresh orientation.

Among senior RAF officers there is an inclination to look upon the heavy bomber as a weapon which has completed its effective life. The view gains ground that the military aircraft of the future will be mainly concerned with carrying and fighting—not with bombing. The air-borne army with fighter escort and tactical support is the popular conception. The big aircraft, therefore, will be transports; the small aircraft fighters. Reconnaissance may become the province of the automatically controlled machine, and all explosives, atomic or other, will be delivered by automatic machines.

Aircraft Electrics

In a discussion which followed the reading of a paper before the Royal Aeronautical Society, several British designers revealed their attitude towards hydraulics, electrics and pneumatics for the services in large aircraft.

The paper was read by R. H. Bound, of Dowty Equipment Limited, and made a good case in favor of hydraulics. But there was no unanimity in the audience. Some argued in favor of combined hydraulics and electrics, but Arthur Gouge, of Saunders-Roe, uttered a warning against compromise and suggested that it might lead to "mongrelizing." The Short Saro *Shetland* flying boat, of which he was the chief designer, is an all-electric airplane.

Pneumatics came in for criticism, although they are much used in British machines. They were said to be dangerous. Argument chiefly centered on a comparison made by Mr. Bound between a hydraulic ram and an electric actuator. It showed, according to Mr. Bound, that simplicity was on the side of hydraulics.

P. W. S. Bulman, for long chief test pilot of Hawkers and now a director, said that manufacturers who fitted hydraulics preferred electrics, and those who fitted electrics preferred hydraulics.

Jets and Boundary Layers

A scheme for combining the benefits of gas turbines and boundary layer control is put forward in a specification lodged with the Patent Office in London under the name of F. Umpleby.

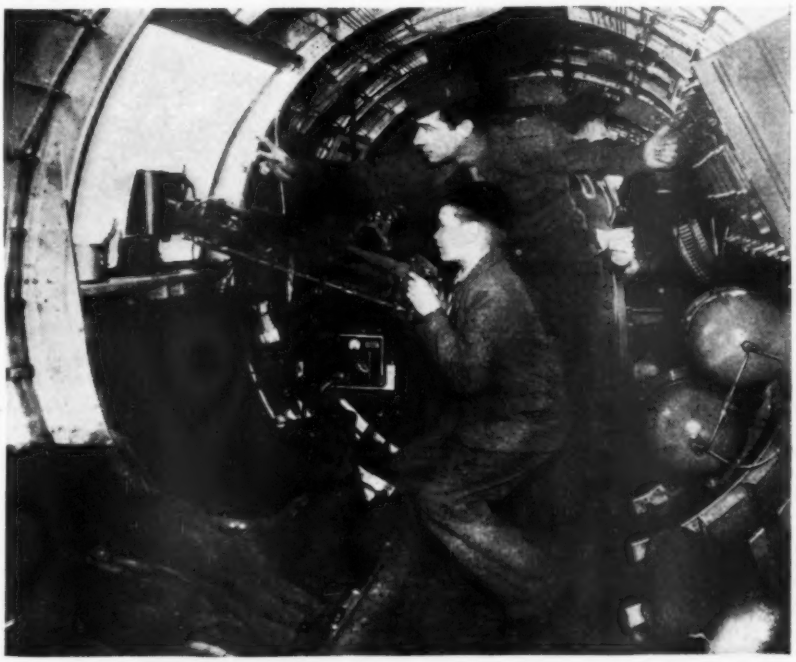
Performance improvements through sucking in the boundary layer over parts of the wings have long been predicted, and Miles built an aircraft in which the boundary layer was to be drawn off by a suction pump through many small perforations in the wing surface. Promising early experiments had to be abandoned owing to war needs.

The new patent suggests that the compressors of gas turbines should draw in their air through slots disposed in the camber of the upper surfaces of the wings. The slots are to be located at the places where separation tends to occur. The object of this arrangement is to prevent separation and therefore turbulence, thus improving the overall performance of the wing.

People and Politics

The ministers in Britain's new (Labor) Government were announced during August. Secretary of State for Air is Viscount Stansgate and Parliamentary Under-Secretary Wing Commander John Strachey. Minister of Civil Aviation is Lord Winster. Minister of Supply and Aircraft Production is John Wilmot with

(*Continued on page* 103)



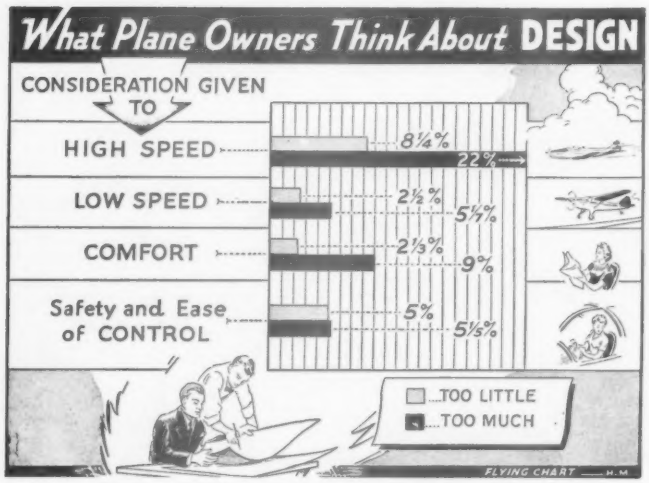
A Fortress gunner shows English schoolboy how .50-cal. waist gun operates as part of "open house" at all 8th Air Force fields in England on 38th anniversary of AAF.

This group is being shown safety features included in the design of this Cub. Such mass education will stimulate aircraft purchases, create vast potential market among men and women alike in all age groups.

WHAT DO PILOTS WANT?

By CHARLES EVANS

Studies suggest that it isn't high speed as much as it is comfort, safety and ease of control.



Plane-owner opinion of present designs indicates conflict on speed, comfort, but is more evenly divided on safety and ease of control.

PEOPLE who ought to know have guessed variously that we will have anywhere from 20,000 to 450,000 private planes within 10 years. An average of seven informed estimates is 210,700 planes within a decade.

But to achieve any such goal, industry and the American public are going to have to make flying better, easier and cheaper. There are going to have to be more landing fields, easier flying regulations, better planes, active Government promotion for flying, and a general era of prosperity.

None of the estimates cited above are by manufacturers. Their opinions are directly to the point, however, and a number of them are expressed in the excellent report, "Post-war Outlook for Private Flying," which was compiled by John Geisse and S. C. Williams for William A. M. Burden, assistant secretary of commerce.

Eighteen manufacturers were asked about the probable extent of private flying after the war and while their answers varied so much that they cannot be summarized, here are a few of the more typical opinions:

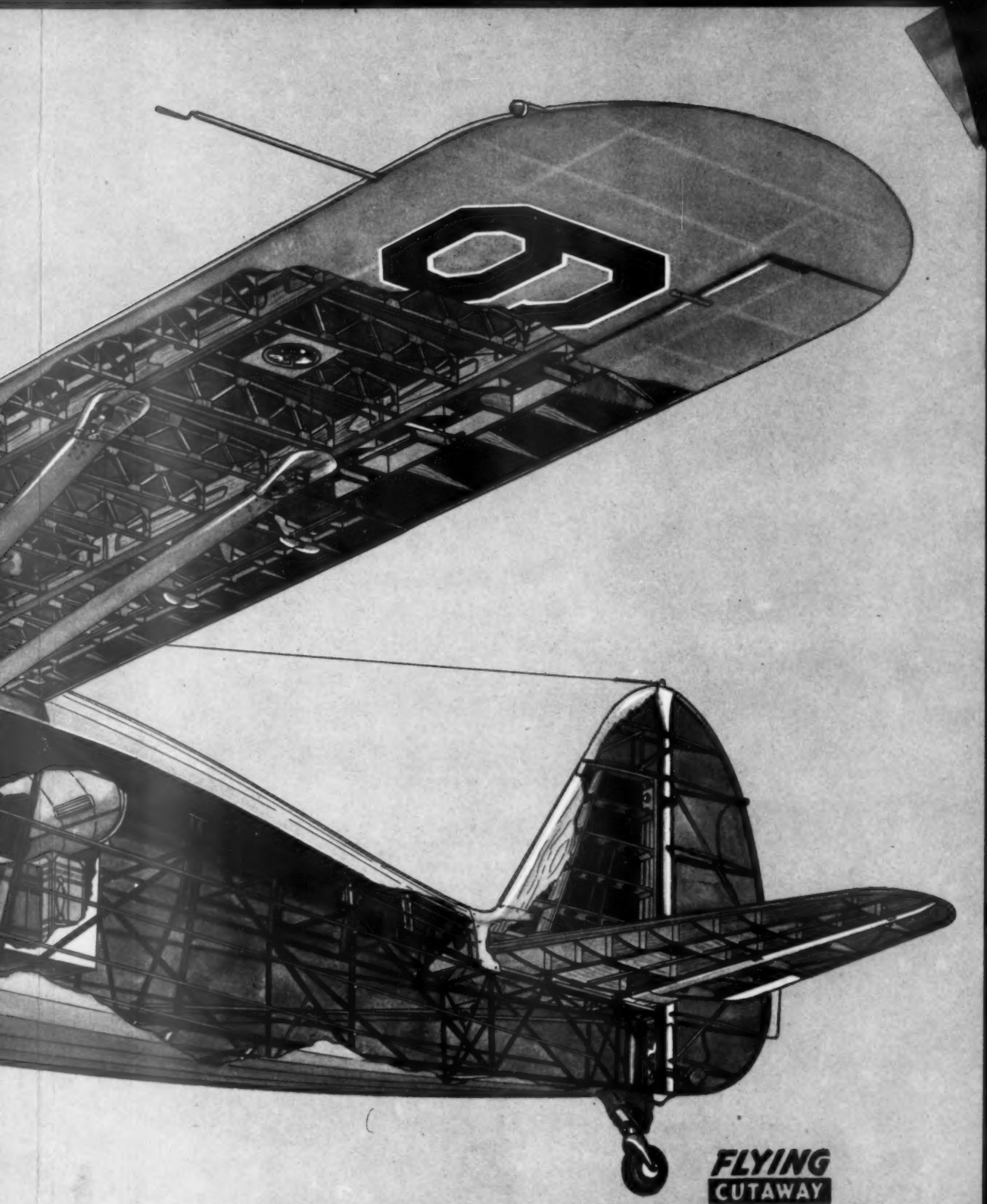
"Unless Government rules make it unattractive, there will be a tremend- (*Continued on page 74*)

Fairchild Forwarder (F-24W), featured in this month's cutaway, embodies many characteristics desired by plane owners who aspire to owning a clean, colorful four-place airplane with a cruising speed of 100 m.p.h.-plus.

FAIRCHILD FORWARDER
(F-24W)

One 165-h.p. air-cooled Warner Scarab engine

WING SPAN: 36 ft. 4 in.	TOP SPEED: 124 m.p.h.
LENGTH: 25 ft. 10¼ in.	CRUISING SPEED: 112 m.p.h.
HEIGHT: 7 ft. 7½ in.	STALLING SPEED: 57 m.p.h.
GROSS WEIGHT: 2,882 pounds	MAXIMUM RANGE: 465 miles
EMPTY WEIGHT: 1,813 pounds	SERVICE CEILING: 12,700 feet
TOTAL SEATS: 4	WING LOADING: 14.9 lbs./sq. ft.



FLYING
CUTAWAY

by

R. G. SMITH and R. J. POOLE

© FLYING, NOVEMBER, 1945

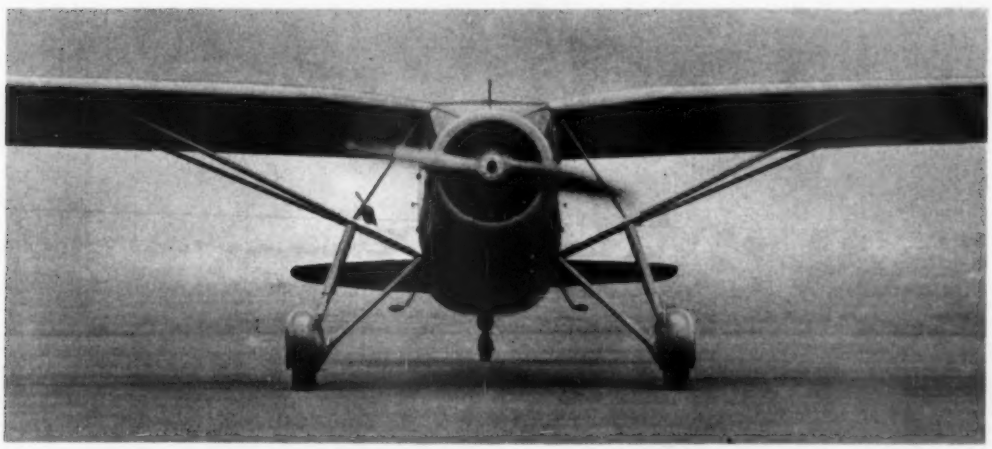
ONE of the most popular private planes in its class before the war, the "24" played an important role in the armed forces as a utility transport. It was designated UC-61 in the AAF, GK-1 in the Navy, and Argus in the RAF. While two models were built (one had a Ranger engine; see below), the most widely-used version has the 165-h.p. Warner. That model—with a number of improvements — will again be placed in production by Fairchild at Hagerstown, Md. It is the model shown on this gatefold.

MORE VIEWS OF THE FORWARDER

Ranger-powered "24" is identical to Warner version except that it is 13 inches longer. This one is a UC-61K.

F THE
DER

There are four standard color schemes for the "24," each of them following the design shown here and on the cutaway drawing. With pilot and three passengers, this model climbs 750 ft. per min. Fuel capacity: 240 gals.



Civil "24" has solid cabin ceiling; military version had a large skylight. Wheel pants can be removed for operations from muddy or snow-covered fields. Post-war model will have redesigned cabin and instrument panel.

ELECTRIFYING the Road to Tokyo

Curtiss Electric Propellers now add to the demonstrated effectiveness of the Boeing B-29 Superfortress:

Greater striking force—made possible by propeller weight reduction.

Shortened landing runs—through aerodynamic braking.

Automatically synchronized propeller speeds.

The unmatched durability of hollow steel blades.

The additional safety of electrical propeller control, unaffected by temperature and altitude and with minimum vulnerability to combat damage.

These new advantages for the Superfortresses on the road to Tokyo mean new destruction for the enemy and increased security for B-29 crews.

CURTISS

Electric Propellers

DIVISION OF **CURTISS WRIGHT** FIRST IN FLIGHT

Over a century ago, an Englishman named William Samuel Henson proposed to fly commercially between England and China. His model airship (pictured here) prophesied the pusher-type engine and the single wing. Henson believed wrongly that by slanting the wing upward enough air would be forced under the wing to support the machine

THE FIRST MONOPLANE (1842)

was designed with high hopes but little **Lift**

IN FLIGHT, an airplane encounters two forces of air: *Lift* that comes from air passing around the wing and *Drag*, resistance of air to the plane's movement. How man flies is determined by the ratio of Lift over Drag.

Many of the "firsts" at Northrop have been steps to reduce Drag or to increase Lift. In Drag-reduction, you find Northrop pioneering the streamlined monocoque fuselage (1927), wing fillets (1929), the all-metal, stressed-skin monoplane (1920). And heliarc welding of magnesium (1940) which promises still lighter, smoother aircraft construction.

On the side of Lift are Northrop's development of split flaps (1932), retractable ailerons (1941) and the *Flying Wing*. The first Northrop "Wing," free of conventional fuselage, flew in 1928. Later versions have housed everything inside the wing, eliminated all tail assembly.

The battle of Lift versus Drag will continue into peacetime. In fact we at Northrop are set now to create both more efficient propulsion and planes of still more advanced design. Planes to fly man higher, faster, farther and on less fuel than ever before.

Northrop Aircraft, Inc., Northrop Field, Hawthorne, California.

Creators of the **Black Widow**

P-61 Night Fighter and the **Flying Wing**

NORTHROP

Navy Air Lab

By JOHN LaCERDA

A NAVAL officer who has smashed up more airplanes, perhaps, than any other man alive blows a whistle, waves the mechanics away from the runway, and drops his arm in a signal.

The engine on the *Buccaneer* dive bomber coughs, and thunders into life. The pilot reaches down, lashes back the throttle, and leaps from the cockpit.

The plane shoots forward down the runway at 40—50—60—70 m.p.h. With a whine and a snarl it plunges into steel cables stretched across the runway.

The cables grab the propeller, bend it, and shut off its spin. The *Buccaneer* flips up on her nose. Her propeller hub snaps off and goes caroming across the field. The ship's fuel tanks crack open and spurt high octane. Crash wagons roll up and unlimber their chemical hoselines. The plane lies on the runway, dead. She has done her bit to help make aviation safer.

This is but one of many experiments being conducted at Philadelphia's Naval Air Material Center to make our planes the best in the sky.

NAMC is to the Navy what Wright Field is to the Army. Its officers believe that it undertakes a greater variety of work than any other aeronautical organization in the world. Every plane now operating with the fleet is said to owe something to testing and experimental work at NAMC.

Located on League Island, opposite the Philadelphia Navy Yard, its history goes back to World War I when its first plane was the twin Liberty-engined Curtiss H-16 flying boat. NAMC has more than 3,000,000 square feet of shop space. It keeps approximately 13,500 persons occupied around the clock. Its engine laboratory alone has refrigeration capacity equivalent to 2,200,000 pounds of ice per day. Its electrical equipment could (*Continued on page* 88)

Check of 42-inch clearance between wheels and ground prepares Corsair fuselage for drop-load test at NAMC.

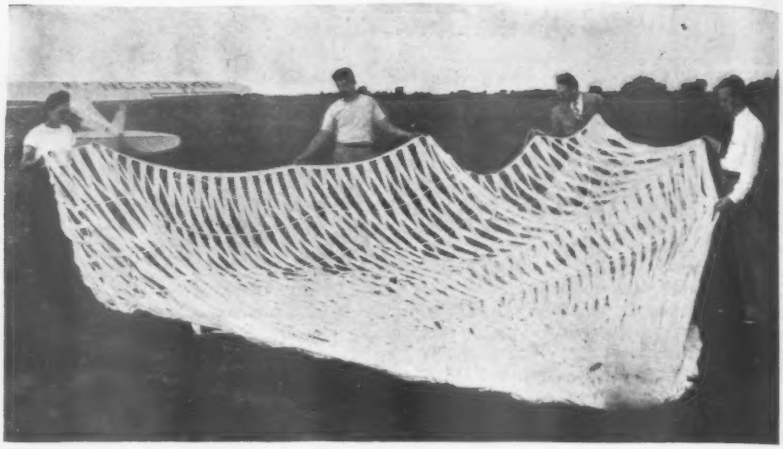
Approval by NAMC means acceptance by Navy's Wright Field—known as Naval Air Material Center.

CRASHING BARRIER IN NAMC TEST

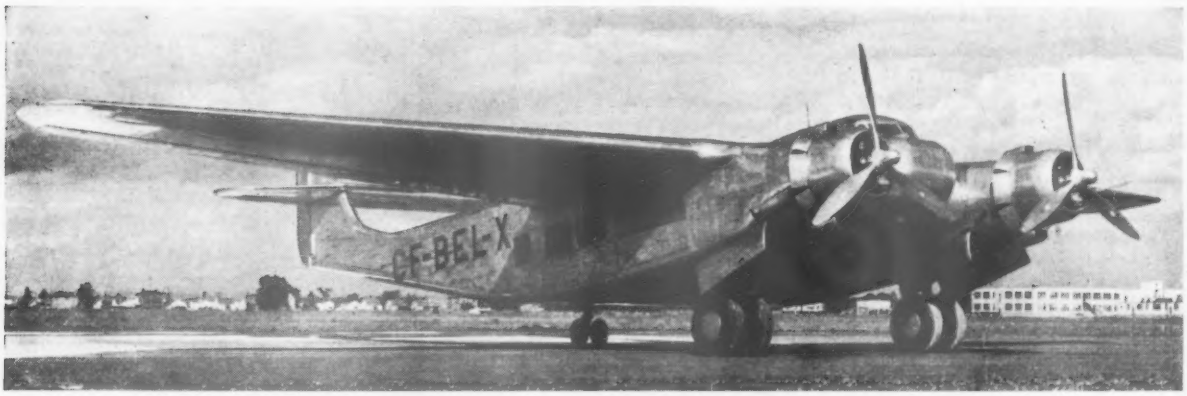
This obsolete Brewster Buccaneer (opposite page and above) was crashed into a restraining barrier in an NAMC safety test. Before a cable barrier design is approved for carrier installation, it must prove its ability to withstand impact of speeding plane. Pilotless Buccaneer, controls lashed into position, sped at full throttle into cables, tilting tail skyward, ramming the nose into the runway (left). Afterward cables are unsnarled from curled propeller blades (above), then sent to laboratories for exhaustive tests that will prove or reject this barrier design.

Have You Seen?

This insect-protection cap was developed by AAF experts in Florida for ground personnel.

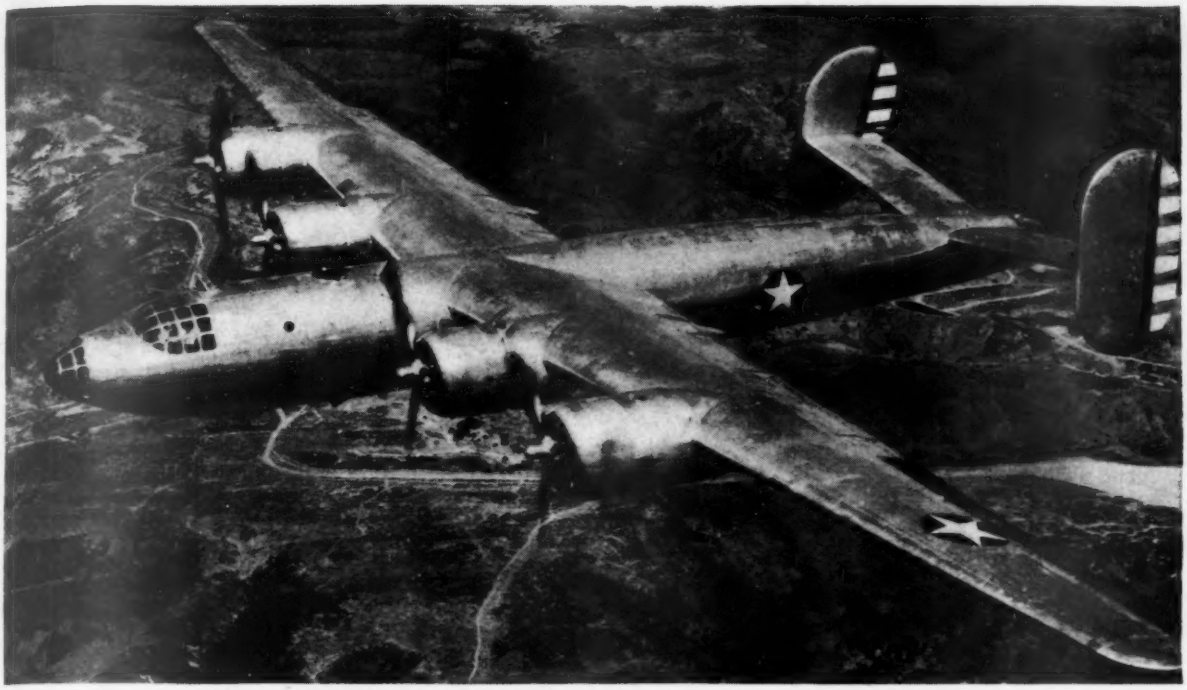


Unusual German parachute is made of silk ribbons to ease shock of jumps up to 425 m.p.h. It apparently was for pilots of jet fighters. Descent rate is similar to U.S. types.



Newest version of Burnelli flying wing has just been completed in Canada. Two 1,200-h.p. Wasp engines give it cruising speed of 185 m.p.h., range of 2,000 miles. It carries 24 passengers. Fuselage is 20 feet wide.

Last version of Liberator in production was B-24N. It has single tail unit, new gun positions, increased horsepower.



Experimental version of Consolidated Dominator (B-32) had twin rudders and pressurized fuselage. An even earlier version had an unbroken, transparent nose similar to B-29. Pressurization later was dropped.

Latest version of RAF's Hawker Tempest is this Tempest II with an air-cooled Centaurus engine of 2,500 h.p. Armament is four 20-mm. cannon, gross weight 11,000 pounds. Wing span is 41 feet.

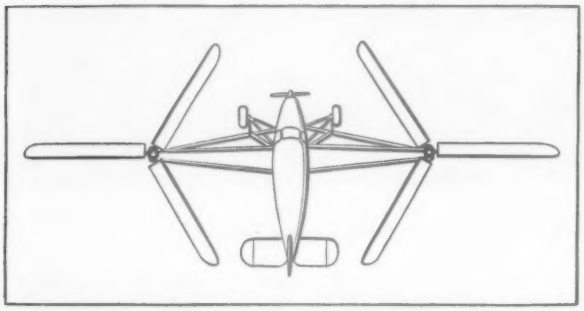
Curtiss XP-62 was experimental Army fighter with six-bladed counter-rotating propeller. Engine was a Wright R-3350 with single-stage supercharger. Cockpit was pressurized for altitude flying.

Douglas XSB2D was predecessor of BTD, was two-place and had twin remote-controlled turrets at tail. Both these Douglas versions have been dropped. Martin is working on similar design.

Recently-released photograph of giant Hughes flying boat (four of its eight engines in foreground) also revealed tail of another Hughes plane (left rear), probably the F-11 camera plane.

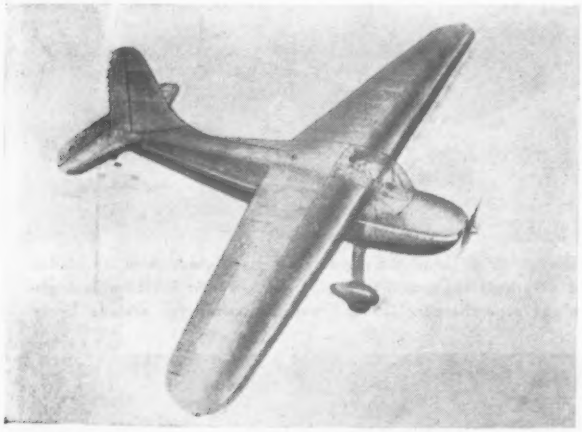
Have You Seen?
CONTINUED

Junkers Ju-290, largest German landplane, now is at Wright Field for tests. It has four 1,750-h.p. engines, top speed of 280-m.p.h. Range is 3,800 miles. German pilot delivered it to Americans, is reported to still be in present crew.



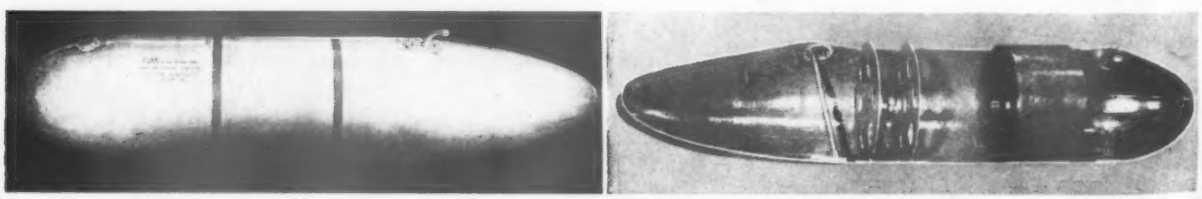
This is a new helicopter design recently patented by the Autogiro Company of America. Twin rotors are driven from central power plant. It is not known whether this design will be built.

Ryan Fireball (FR-1), Navy's newest carrier fighter, has 1,350-h.p. Wright engine in nose, GE jet unit in tail. Climb is over 5,000 f.p.m., maximum range 1,500 miles at cruising speed of 207 m.p.h.



Midwest Mercury is a proposed lightplane with 75-h.p. engine. Cantilever wing spans 32 feet. Gross weight is 1,200 pounds, cruising speed 105 m.p.h., range 400 miles. It is two place.

New British flying boat is Short Shetland. It has four 2,500-h.p. engines, span is 150 feet. Gross weight is 130,000 pounds, top speed 267 m.p.h. Range is 2,076 miles with 13½-ton load



Expendable belly tanks for Thunderbolts were being made in England at rate of 5,000 weekly. Tanks are made of Kraft paper, with plywood baffles. Length is 8 ft. 4 in. long, diameter is 21 inches. Tank hangs under fuselage, carries 108 gallons of 100 octane fuel.

HE'S on the ground while YOU fly!

It's a great sight to see the Aeronca sign on a dealer's hangar. You know that back of it is a solid citizen who knows his business and is ready to deliver complete service—that back of him is the planning of a 17-year old company, makers of the first light plane ever built.

• • •

The idea of promoting airstrips all over the country grew naturally out of Aeronca's long experience in the field. They knew that personal planes need landing fields and service so you can fly everywhere—just as cars needed roads and service stations so everyone can drive.

• • •

Aeronca's new plane designs fit personal needs, too. Equipment to suit your taste. 2-passenger to family capacities. Latest equipment, like tricycle landing gear and electric starters on some coming models. All easy to buy and easy to fly! Complete descriptions in "Aeronca—the Plane You'll Want to Fly." Mail 10¢ for your copy to Aeronca Aircraft Corporation, Dept. F-11, Middletown, Ohio.

• • •

(Export Agency—Aviquipo, Inc., 25 Beaver Street, New York 4, N. Y.)

AMERICA'S PERSONAL PLANE

AERONCA

has an important message for air-minded people

Letters

MEMO TO SERVICE PILOTS

Sirs:

In Kurt Rand's article, "Your Own Airport," FLYING's September issue, an erroneous statement was made regarding the issuance of CAA ratings (instrument, instructor and horsepower) to present or ex-service pilots.

Mr. Rand states such ratings are issued to applicants with military competence passing only a written examination on air traffic rules. This is not entirely true. Civil Air Regulations Part 20.561 on ratings states:

"(b) *Instrument rating:* will be issued to applicants who hold effective military instrument ratings if requirements for issuance of such rating and privileges authorized by it are not less than the requirements of the CAR for the issuance of an instrument rating and the privileges authorized by such rating."

Only service pilots holding green instrument cards may receive an unlimited CAA instrument rating on his civilian pilot certificate without further examination. Service pilots with no instrument card, or cards other than the green one, must first successfully pass the CAA instrument written examination and, thereafter, an instrument flight test with a CAA inspector or instrument flight examiner.

Service pilots applying for flight instructor ratings must also pass the prescribed written examination and subsequent flight instructor test with a CAA inspector.

Horsepower ratings are no longer entered on the pilot rating record. CAR Part 43.680, General, states "no pilot shall fly an aircraft carrying passengers unless within the preceding 90 days he has made at least five take-offs and landings to a full stop in aircraft of the same type and class, and of a rated horsepower within 50 per cent of the horsepower of the aircraft to be flown."

Since we are receiving requests from service pilots for instrument and instructor ratings based on the statement in your article, we should like to have this matter clarified.

A. GODDARD
Acting Chief, General
Inspection Branch, CAA
Chicago, Ill.

● Information in the article came from an official CAA source in Washington which, in this case was apparently erroneous—ED.

GOLDFISH CLUB "FISHERS"

Sirs:

As you know, the submarine service has played no small part in qualifying many members of the illustrious "Goldfish Club" (May issue, FLYING). It has been our pleasure to initiate many downed flyers we have rescued into the solemn mysteries of the great deep.

May I propose a membership in this order for the "Fishers," those officers and men who have participated in the rescue of these downed comrades-in-arms?

COMDR. CYRUS C. COLE, USN
FPO, San Francisco, Calif.

● FLYING has passed on Commander Cole's excellent suggestion to Goldfish Club headquarters in London.—ED.

ROCKETS FROM INDIA

Sirs:

In "Rockets and Aircraft" (FLYING, February) the author states that Munroe's principle involves the launching of the rocket. This is in error, for the Munroe-ring, or hollow cylinder explosive principle refers to the warhead carried by the rocket.

Munroe discovered that a charge of this shape has many times the disruptive power of a lump of explosive of the same weight. Hence, this principle of the "bazooka" has borne his name.

AMITABHA SEN
Calcutta, India

● The information in FLYING's article was received from a reliable source.—ED.

NEWTON VERSUS CHARLES

Sirs:

Authorities on jet propulsion all seem to think Newton's third law is the primary one concerned with the propulsive force. I think that Charles' law is the primary basis of this theory. And when credit is handed out, don't forget the principle of Boyle's law.

PVT. W. C. HELMS, JR., USMCR
Memphis, Tenn.

● Newton's third law states that action and reaction are equal and oppositely directed; Charles' law states that if pressure remains constant, the volume varies directly as the absolute temperature; Boyle's law says that the temperature remaining constant, the pressure varies as the volume.

While all three are involved, we believe Newton's law governs the generation of propulsive force.—ED.

BY-LINE CORRECTION

Sirs:

Your interesting article "Air Trade with the Americas" (FLYING, August), shows the author, Dr. John B. Crane as Chief of the Transportation Unit, Bureau of Foreign and Domestic Commerce. Dr. Crane is Director of Research, Glenn L. Martin Co., Baltimore and held that position when he submitted the article.

I have held the position of Chief of the Transportation Unit in this Bureau since January 8, 1945.

JAMES C. NELSON
Chief, Trans. Unit, Dept. of Commerce
Washington, D. C.

● The word "formerly" was unintentionally omitted in printing the by-line for the article. Our humble apologies to Mr. Nelson and Dr. Crane.—ED.

FORGOTTEN MAN

Sirs:

My heart weeps for "Forgotten Man" Bosley whose plaintive tale appears in "Letters," of FLYING's August issue. I too, was over 30, with four children and a CPT and WTS instructor. When my usefulness as a flight instructor ended, I volunteered, and am now doing my own laundry, cut lawns, wax floors and ask for an evening off if and when I can get it—all for $66 a month.

I can refer him to over 4,000,000 men who would gladly trade places with him, sans service rights.

AMM2/c WM. D. RAMEY
Jacksonville, Fla.

MID-AIR COLLISIONS

Sirs:

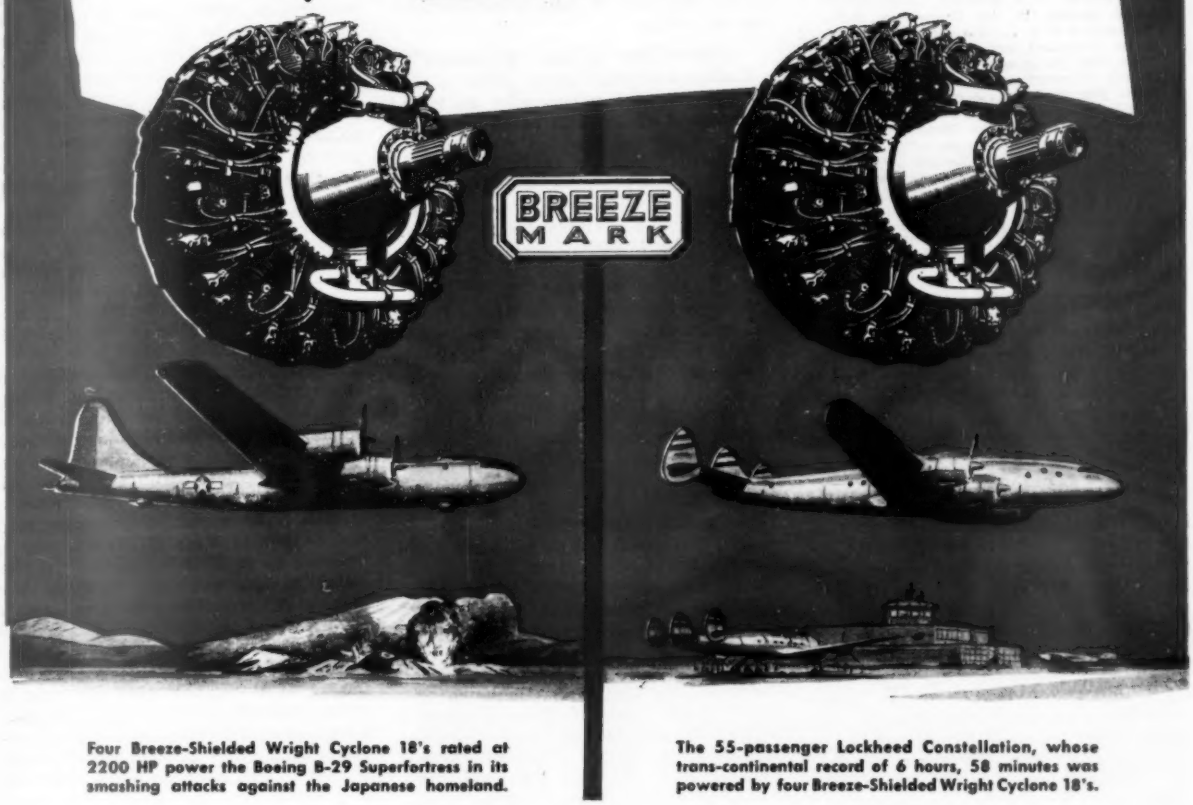
I noted the article in FLYING's August issue on mid-air collisions. It seems the accidents are caused by pilots, not being sure of the traffic pattern or circuit direction. If this is true, why not have wooden arrows at the upwind end of runways, showing the direction in which

(*Continued on page* 110)

". . . Then he says, okay you fly it—I'll navigate."

MILITARY or COMMERCIAL

—they're BOTH Breeze Shielded



Four Breeze-Shielded Wright Cyclone 18's rated at 2200 HP power the Boeing B-29 Superfortress in its smashing attacks against the Japanese homeland.

The 55-passenger Lockheed Constellation, whose trans-continental record of 6 hours, 58 minutes was powered by four Breeze-Shielded Wright Cyclone 18's.

● For many years Breeze has been recognized as the General Headquarters for Radio Ignition Shielding. The reputation which the products bearing the Breeze Mark of Quality built up on national and international airlines before the war has now been augmented by the service record of thousands of Breeze Shielding Assemblies for America's famous fighting aircraft, tank, marine and commercial engines. When final victory has been won, Breeze will once again be able to return to production of Shielding for commercial applications without delay for reconversion. And the reservoir of Breeze Shielding experience so materially increased in maintaining dependable communication in war, will be available to help pace progress in peace.

BREEZE
Corporations Inc.
NEWARK 7 NEW JERSEY

Other Breeze Products ● SHIELDING FOR AIRCRAFT ● MARINE ● ELECTRONIC APPLICATIONS OF ALL TYPES

AOPA NEWS

The Aircraft Owners and Pilots Association (AOPA), with National Headquarters Office located in the Carpenters Bldg., Washington 1, D. C., is a non-profit organization composed exclusively of pilots. It looks after the pilot's best interests in all phases of aviation and helps individual pilots with their individual problems. The AOPA operates with a full-time professional staff and is the largest group of civilian pilots in the world. This column is edited by the Aircraft Owners and Pilots Association and opinions contained in it are not necessarily those of FLYING. A special bulletin is sent each month to all registered AOPA pilots and also confidential newsletters from AOPA's Washington staff are sent members from time to time.

ALTITUDE HEADINGS

CAR Part 60, as adopted, with an effective date of August 1, 1945, stipulated in part that aircraft flying on instruments "off airways" maintain certain headings according to *true* bearings. This regulation has now been changed so that *magnetic* bearings are used.

Since it is recommended that pilots adhere to these quadrant altitudes in contact as well as instrument flight, the revised regulation is quoted below. (See last month's AOPA *News* for a complete summary of the new regulations affecting personal aircraft and private pilots.)

"CAR 60.24 Cruising Altitudes. Aircraft shall be flown at the following cruising altitudes: (a) Inside a control area, an airport approach zone, or an airport traffic zone at altitudes authorized by the control tower. (b) Elsewhere, except for necessary ascent or descent, at altitudes corresponding to the direction of flight as indicated below:

Magnetic Course	*Ind. Alt.* (ft. above S/L.)
0°- 89° inc.	Odd thousands (1,000, 3,000, etc.)
90°-179° inc.	Odd thousands plus 500 (1,500, 3,500, etc.)
180°-269° inc.	Even thousands (2,000, 4,000, etc.)
270°-359° inc.	Even thousands plus 500 (2,500, 4,500, etc.)

INSTRUCTORS GIVE EXAMS

"Waiting for an inspector" has long been a "gripe" among pilots. In place of pilots waiting for CAA inspectors to visit their airports, or traveling long distances to find an inspector, pilots will shortly be able to take their written exams from selected flight instructors or "designated flight examiners," whose numbers are to be increased to 15,000. This raises the original total of examiners which was 2,000 as of last January. It is hoped that the goal of 15,000 may be reached in 18 months. Flight examiners should be over 24 years of age and have at least 1,000 hours of solo flying and 500 hours of instruction. Interested AOPA pilots should make application to their respective CAA regional offices.

LICENSES FOR "L" AND "G" PILOTS

Liaison and glider pilots, rated as such by the armed services, may be issued commercial pilot ratings based upon military competence provided they can substantiate by military document not less than 200 hours of first-pilot experience in powered military aircraft, accumulated after having been officially rated as Liaison or Glider Pilots.

VOX PILOT

Pilot to AOPA: If I clear from Grand Forks, N. D., to Winnipeg, Man., will I be allowed to fly my plane locally in Manitoba? What are Canadian regulations?

AOPA to Pilot: Winnipeg is an official port of entry into Canada and you may land there and report to a customs inspector. No previous permission is necessary either from CAA or the Canadian Government. You would be permitted to fly your plane locally. However, gasoline for use in aircraft is not available in Canada except for essential purposes, such as scheduled and military flights. It would, therefore, be necessary for you to carry with you from Grand Forks enough gasoline for your return flight, and this regulation would limit your flying activities while in Canada. If you desire to make this flight, we suggest that you obtain a copy of The Defence Air Regulations in Canada from the Civil Aviation Division, Department of Transport, Ottawa.

Pilot to AOPA: Before joining the AAF I held a commercial rating and an instructor's certificate. Can you advise me what steps are required now by the CAA to renew these licenses?

AOPA to Pilot: If more than two years have elapsed since the issuance of your commercial license, it will be necessary for you to pass a flight check given by a rated flight instructor and obtain a statement from the instructor to the effect that you have been flight checked. You may not use your flight instructor's rating until you have demonstrated your proficiency to a CAA inspector. A flight instructor's rating is good for one year only, unless the holder has given at least ten hours of flight instruction during a 12-month period.

Pilot to AOPA: Part 43.60 of the Civil Air Regulations states that a private pilot shall not pilot aircraft for hire, but permits sharing the expenses of a flight or piloting aircraft in furtherance of a business when the flight is made solely for the personal transportation of the pilot. Does this mean that a person possessing a private license cannot take a person along with him in an aircraft merely because his passenger friend might have some business matters to look after at our point of destination so long as this passenger pays no part of the expenses? Does it also mean that a private pilot cannot fly a passenger in an airplane rented by the passenger if the purpose in renting the plane was to make a business trip if the pilot does not accept any personal remuneration?

AOPA to Pilot: A private pilot may fly an airplane when rental is paid for by the passenger for the purpose of making a business trip. The pilot cannot accept any personal pay in connection with the flight. A private pilot cannot pilot any airplane for which remuneration is received by himself or by any group of persons by whom he may be employed; i.e., he can't fly commercially on a private ticket.

Pilot to AOPA: How can a person whose eyes are correctible to 20/20, but without glasses cannot meet the commercial requirement, get an instructor's rating and charge for services? I have flown 400 hours in the past five years. It is not a question of ability.

AOPA to Pilot: A private pilot may attain a flight instructor's rating. He may not give instruction for hire unless he possesses a commercial pilot certificate. The visual acuity requirements for a second class medical certificate, for a commercial license, are that vision must be at least 20/20 in each eye, or vision must not be poorer than 20/50 and may be brought up to 20/20 by glasses. If your vision is poorer than 20/50 without glasses, you would be unable to meet the requirements for a second class medical certificate.

AOPA is making every effort to have the physical requirements for pilot licenses relaxed, and we have been partially successful with regard to the requirements for a third class certificate. It is hoped that some favorable action will be taken in the near future with regard to making revisions in second class medical requirements.

Pilot to AOPA: Do you have a legal lease form a city might use in leasing a city-owned field to a private operator? What should be included in it to protect non-scheduled flyers?

AOPA to Pilot: We have a sample management contract for leasing of a municipal airport to a private concern which we believe will be of help to your group.

Pilot to AOPA: The medical certificate attached to my pilot's certificate expires September 12, 1945, since I am in service, and am unable to renew it by taking a physical exam. Does this mean that my certificate will expire and that I will have to go through the written exam and flight test? Or will it be good until I arrive in the States again?

AOPA to Pilot: Your CAA medical certificate is now good for a two-year period, under the new regulations which went into effect on July 1, and it is extended, therefore, until Sept. 12, 1946. A pilot must hold a valid medical certificate before he may legally use his pilot's license. END

Announcing

MODEL A-12

GYROPILOT*

THIS SIMPLE control unit gives the human pilot complete automatically stabilized control of his aircraft at all times.

A-12 FOR . . .

- Automatic approach and automatic landing
- Perfectly banked turns at *any* air speed—automatically
- Gyrosyn Compass directional control—continuously slaved to the magnetic meridian
- Automatic holding of any selected altitude
- Automatic trim of elevator controls regardless of changing load conditions
- Utmost in passenger comfort—precise control and elimination of over-control, "hunting," and "wallowing"
- Electrical and mechanical interlocks—automatically insuring proper manual operation
- Automatic and instantaneous synchronization—no matching of pointers or other indications
- Maximum ease of installation and simplified maintenance—any unit can be replaced in a matter of minutes

Our Aeronautical Department invites your inquiries on A-12 Gyropilot installations.

*TRADE-MARK REG. U. S. PAT. OFF.

SPERRY GYROSCOPE COMPANY, INC. GREAT NECK, N. Y.

★

Division of the Sperry Corporation

LOS ANGELES • SAN FRANCISCO • SEATTLE • NEW ORLEANS
CLEVELAND • BROOKLYN • HONOLULU

GYROSCOPICS • ELECTRONICS • RADAR • AUTOMATIC COMPUTATION • SERVO-MECHANISMS

Planes Won't Sell for $1,000

(Continued from page 23)

plane manufacturer for a model retailing at about $2,000. His figures are arranged somewhat differently but come surprisingly close to those estimates.

	Cost	Per Cent of Total
Engine	$ 375	18.75
Materials	385	19.25
Direct labor	300	15.00
Factory overhead (including engineering, tooling, inspection, etc.)	300	15.00
General overhead (advertising, sales expenses, office and administrative cost, etc.)	65	3.25
Manufacturers profit	75	3.75
Merchandising cost (distributor and dealer commission	500	25.00
List price	$2,000	100.00

The fact that this manufacturer, according to his own account, is netting only 3.75 per cent of the final selling price of the plane should end the myth that prices can be reduced by cutting profits. No, substantial price cuts can only be made through the economies of true mass production.

But this isn't the whole picture. Besides the engine, the above manufacturer buys the following major components from sub-contractors: propeller, $21 to $28; wheels $16 per pair; wheel brakes, $12.50 per pair; brake cylinders $10 per pair; tires, $8 per pair; tubes, $5 per pair; tail wheel, $8; tachometer, $3 to $4.50; compass, $8 to $12; air speed indicator, $5 to $7; altimeter, $5 to $11; and oil temperature and pressure gauge, $3 to $5. These are included under the above heading of materials, and total from $104.50 to $127.

In short, it is costing this manufacturer $1,425 to produce an airplane that will retail at $2,000. Where then, are we going to start cutting our cost?

Tsongas and Macomber estimate that one dollar saved in direct manufacturing cost means roughly $2 saved in selling price.

Perhaps the first place to start cutting down in direct manufacturing cost is in the engine. William Stout, the automobile and plane designer, has persistently campaigned for a 100-h.p. airplane engine weighing 100 pounds to sell for $100.

While Stout's 100-pound weight goal is not likely to be achieved soon, by automobile standards a 100-h.p. engine selling for $100 is not out of line. By mass production, building at the rate of 500,000 to 750,000 units per year, automobile manufacturers do make an 85 to 90-h.p. engine, including ignition system, generator, fan, starter and carburetor for less than $60. The fact that it weighs twice as much as an airplane engine of similar horsepower, and is unsuited to aircraft in some other ways, does not alter the basic accomplishment.

The wholesale cost of a 65-h.p. air-cooled engine for lightplanes averages about $400 today. Obviously a lightplane manufacturer can't put a $400 engine into his plane, make a profit, have his dealer make a profit, and still sell the plane for $1,000.

The penalties of small production in aircraft engines are demonstrated in this single instance, cited by Carl T. Doman, chief engineer of Aircooled Motors Corporation. He estimates that in 1940 it cost three companies about $1,000,000 to develop three 50-h.p. engines and prepare them for production. At most, these three companies expected to sell 10,000 of the 50-h.p. engines before they would be superseded by a more popular 65-h.p. engine. Thus there had to be a write-off of $100 per engine produced for engineering and tooling alone. That's nearly twice the total cost of the 85-90-h.p. automobile engine—and only for tooling!

Another problem is in standardizing accessories for engines. Each aircraft manufacturer has insisted on a particular engine design to meet his own needs. He has failed to standardize manifolding, accessories, gear reduction units, or engine mountings. Perhaps in the near future we shall find engines furnished complete with cooling ducts and baffles.

Other developments are in the wind. The AC Division of General Motors is making tentative plans to sell an entire instrument panel to be installed in lightplanes as a unit. This might be another big step in reducing our present plane costs.

Though not approaching automobile manufacturing volumes, the manufacture of aircraft during this war has given plane builders a great deal of production know-how which will go far to reduce airframe costs.

Yet if we're to have all-metal private planes after the war, something has to be done to reduce material costs. A good grade of aluminum extrusion bought at prices as low as the Government has been able to purchase it during the war has cost somewhere around 45 cents per pound. Alclad 24 ST sheet in carload lots on a mass-production basis has been around 36 cents per pound. But already the aluminum mills are closing, for where are they going to get the carload-lot orders to keep this price so low?

Again we have the cycle working. We may not have enough aircraft production in the entire country to keep one of the big sheet mills working. If we can't keep it going, then the price of sheet goes up. Following that the price of planes goes up and our chances of cutting the price to achieve mass-production begins to go down.

What then, are the chances of the future?

First, it is possible that one large manufacturer might risk his entire enterprise and launch a large-scale plane building program without reference to his orders on hand. He would install true mass-production machinery. He might tie in with a large engine manufacturer, or buy his own engine factory. He might go bankrupt or he might become the Henry Ford of the aircraft industry. It will take courage, close study, a good dealer organization, a well-designed and carefully-engineered plane, and—a potful of dough which isn't held too dear to risk.

Another promising possibility is the development of a light air-cooled engine for automobiles which could double in airplanes. The mass-production of the autos would achieve the low engine price which the aircraft manufacturer needs to reduce his own aircraft cost.

Thirdly, the industry might continue as it is, reducing costs gradually and making improvements in technique slowly, taking full advantage of the materials and processes developed during the war. If this latter course is followed, it will probably take more than 10 years to reach the 300,000-plane goal which the average forecast predicts for 1955. END

The GOLDFISH CLUB

The Goldfish Club was formed to recognize the thousands of pilots and aircrewmen who have ditched their aircraft at sea and saved their lives through the use of emergency life jackets and dinghies. To apply for membership in the American division of the Club, the following information should be submitted to the American Secretary, Max Karant, Managing Editor, FLYING, 185 North Wabash Avenue, Chicago 1, Illinois:

1. Name, rank and serial number
2. Service address
3. Home address
4. Date and location of incident
5. Description of incident
6. Signature of applicant
7. Signature of commanding officer

Beginning with this issue, FLYING will present a list of Goldfish Club members as they appear on the official club roster.

Whittaker, James C., A
Shields, Clyde S., A
Payne, John S., M
Shelley, John G., Jr., N
Clark, Dudley R., A
Fairchild, A. P., N
Crabtree, Albert M., Sr., A
Meier, J. G., N
Ewing, Phillip D., N
Rauth, John F., A
Messick, Turner P., A
Nielsen, John L., N
Bridge, Arthur H., A
Slavic, J. F., N
Martin, J. W., N
Johnston, L., N
Green, L. M., N
Groncki, E. J., N
Wright, L. G., N
Bond, G. A., N
Trudeau, T. O., N
Allen, W. B., N
Bonaviri, J. A., N
Labas, A., N
Mackinson, James A., Jr., N
Griffis, Arthur T., N
Morris, George W., Jr., N
Autio, John R., N
Barr, Robert P., N
Angley, Clyde C., A
Carter, Kenneth E., N
Campbell, Bruce S., Jr., A
Hintermeier, Richard H., A
Angell, Robert G., A
Wallace, Gordon F., RCAF
Highfill, Tom A., M
Ellis, Henry A., Jr., M
Smith, George R., A
Voracluk, C. W., A
Haney, George R., A

A—Army, M—Marine Corps, N—Navy

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It's the Map That Counts

(*Continued from page 32*)

is called *cultural* features, which include cities, highways, railroads, roads, bridges, underpasses, race tracks, dams, towers, steeples, electric transmission lines, state boundaries and special marks such as mines, lava beds, oil wells, etc. Cities are in yellow and vary in size to indicate the actual shape and appearance of the populated area; highways are double lines, following every turn and showing crossings, underpasses, overpasses, and bridges; railroads are black lines with small cross-lines; canals are represented by blue lines.

There are certain miscellaneous data on a strip map of value to instrument pilots. For example, airports shown by small circles have elevation in feet, with the sign "LF" when there are lighting facilities available. Although next year's maps may have some symbol changes, here are the most important at present: airways are shown by two parallel red lines, 10 miles apart. In between is a red, wedge-shaped radio beam with "A" and "N" on either side. They converge at the station, with call letters and frequency indicated. Present airport symbols are double circles for military fields, a cogwheel for civilian, and a cross for intermediate fields. A few changes may occur in newer maps.

For night and instrument flying, marker beacons, rotating beacons, and flashing beacons are invaluable aids. Special equipment is necessary to receive the high-frequency marker beacons, but anyone can see and use flashing beacons. These are indicated by stars, stars with arrows, and stars with small lines.

After one has studied the map and has learned how to read it, the next step is to obtain practical, first-hand experience. And although it is entirely possible to fly cross-country safely without instruments, the first few practice flights should be made with a map *plus* a good, calibrated compass.

There are some parts of the country over which one can become lost and stay lost, and over which it is impossible to tell direction without a compass when the sun is obscured. In Georgia, the Carolinas, New England in summer, Texas any time of year, or any terrain covered with dense foliage, an experienced pilot must be continually alert to note check points.

First flights should consist of short, triangular courses over easily identified territory, such as country having section lines. A flight from Detroit to Kalamazoo is a good example. Check points appear every quarter hour, and the section lines run east-west, north-south. Experience proves, however, that to depend upon section lines alone is foolhardy, because in Ohio they suddenly change direction, and in Texas they are almost nonexistent. The only place they should be used is over terrain with which the pilot is familiar; in strange territory, don't trust them.

Before setting out on a cross-country trip, many pilots prefer to rule a line between each stop, and mark the magnetic heading on this line, with an arrow beside the numbers to indicate direction. This can be done either with the *compass rose*, a 3½-inch circle on the map that contains all the degrees of the compass, or by means of a protractor. As the compass rose method requires a parallel ruler, the protractor is more convenient.

Lay the protractor on the intersection of the course-line and a longitude line (vertical meridian). Read the angle between the course-line and north, which of course is the same as the longitude line. This is the *true course*. Now on the map, find the red, dotted, isogonic line indicating magnetic compass variation in that particular area: suppose it reads "15°E"; if so, subtract this easterly variation from the true course to obtain the magnetic course.

When one is lost without a compass, the first problem is to locate any one of the four cardinal compass points. When the sun is shining this can be determined approximately.

The old Boy Scout method of locating south by means of a watch is both reliable and inaccurate. It works perfectly at the north pole, but is useless at or near the equator. In the United States it is better than nothing, but the error may be as high as 30° in the late afternoon. Also, the error increases the farther one is from the meridian of the time zone: for example, in Detroit, on eastern time, the sun is not actually overhead (12 noon) until about 12:32. A half-hour represents about eight degrees of sun travel.

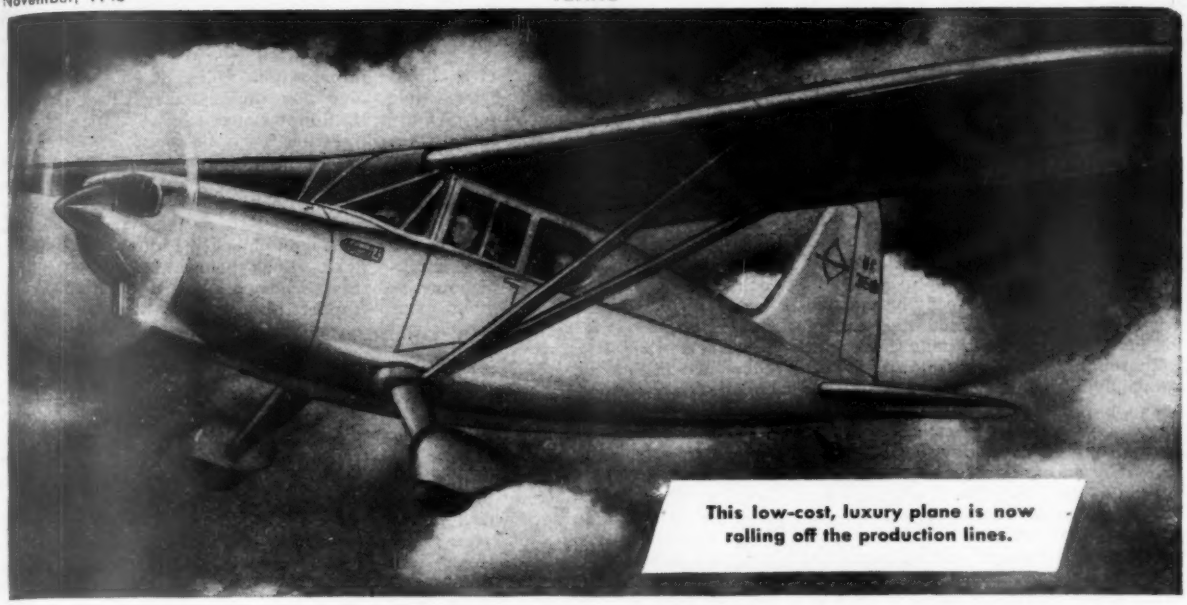
The method utilizes the knowledge that the sun apparently goes across the sky at the rate of 15° per hour, and at noon, *sun time*, is at the zenith and consequently in the south (viewed from the northern hemisphere). In any standard time zone at 12:00 *standard* time, the sun is practically due south. At two p.m. it will have apparently travelled 30°.

To measure 30°, use your watch. From 12 to three is 90° so from 12 to one is 30°. Therefore, when it is two p.m. point the little, or hour hand at the sun. South must be in line with the figure 1, or 30° to the left.

Users of this method are cautioned that it is *approximate only* and capable of errors of many degrees, depending upon one's longitude and latitude. The farther from the time zone meridian, and the farther south, the more inaccurate. Still, it is better than nothing at all, lacking a compass or direction finder.

Another way to orient oneself is by means of a map. This point must be greatly emphasized: *orient the map with the earth.* In other words, the north edge of your map must always point north.

There is no argument in favor of holding the map upright in one's hand except that it is easier to read the names of towns. An old-timer therefore turns his map so that north is north. If he is flying south the map is upside down, but the terrain below him and the map are



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Traditional Stinson safety is built into the Voyager 125. High in inherent stability, it nevertheless has wing slots to make it spin-resistant. Its flaps make the shortest runways seem comfortably long.

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You'll travel in the Voyager 125 at a cost of less than 6 cents per mile . . . approximately 1¼ cents per seat per mile. That includes all operating costs.

You'll have the assurance, too, that this plane is backed by Stinson's 20 years of experience in building quality personal planes, and by the vast research and manufacturing facilities of Consolidated Vultee Aircraft Corporation.

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correlated exactly. The rivers, roads, towns and lakes are just where they appear to be. Furthermore, the courseline and the track are in the same straight line, while the longitudinal axis of the plane is off only the amount of drift caused by the wind.

So, with the compass broken or inoperative, a pilot may use the sun for approximate heading, and the map. Once the map is oriented with the first large town, lake, river, or railroad, he can then place the plane on the desired heading. By always keeping the map oriented, the pilot will find it easier to fly his heading accurately or, at least, accurately enough for him to pick up the next checkpoint.

Therein lies the secret: selecting checkpoints, flying to them, and picking out the next one. It is not always easy. With the sun obscured, the ceiling down to contact minimums, and visibility of one mile, only an experienced and expert pilot could navigate without a compass.

Next comes the actual flying of checkpoints. What we want is literal pinpointing on the map: locating oneself at the point of a pin. To look over to the left and see Podunk a mile (or two—or three?) away is not good enough. We want to be directly over our pin-point, and that means within 1,000 yards of it under 1,000 feet, and within a mile over 5,000 feet.

The first step is to orient the map. Then place the airplane along the course line drawn in pencil before the flight. If the map is oriented and the longitudinal axis of the plane is the same as the course line (plus or minus wind-drift), you are headed correctly. As a final check, locate south by means of the sun.

The second step is to select a checkpoint as near to the course line as possible and as far ahead as you can see. Under poor visibility conditions at low altitude this will be only two miles or so; in the west one can see Guadalupe Pass for 50 miles or more. The farther ahead the checkpoint is visible, the easier it is to fly on it.

The third step is to recognize checkpoints. In some parts of the country, as from Washington, D.C., to Atlanta, Ga., the towns, roads, rivers, railroads and landmarks are almost invisible from a short distance because of dense foliage. Small streams are almost completely hidden, and it requires sharp eyes to pick them out; some towns look just like another, but almost always there is one salient feature: an extra railroad, highway, steeple, race track or tower. Be *sure* you're over the right town.

Fourth: jot down on the map, or kneepad, the time of passing the town, like this: 0:17. That means you are 17 minutes on your way, having set your panel clock to 12:00 on take-off. Now put your index finger on that town and *hold it there*. Locate the next checkpoint. Having figured out your ground speed to be 87 m.p.h., where should you be at what time? How fast should you move your finger?

You don't need a computer to solve the problem: remember that six minutes is 1/10 of an hour. In six minutes, therefore, you should be 8.7 miles along the course line. Measure about nine miles down the line and write: 0:23 ETA. In other words, you estimate that the plane and your index finger will be there at 23 minutes after take-off.

Fifth: learn to recognize distance on the ground and reconcile the shape of objects on the ground with objects on the map. Look at the map and note your altitude. Now measure the distance between an object like a town and a nearby lake. Look below at the real objects: that is how distance looks from your altitude. Next, look at the shape of a river on the map: glance at the ground and correlate the two. Do this every time you fly—it is well worth the effort.

Sixth: Use everything you can for guides and check points. Don't disdain to use railroads or highways—leave dead reckoning to professional airline and aircraft carrier pilots who have to fly by compass and instruments.

Seventh: When there are absolutely no check points, hold your course by flying straight on a hill, a dark object on the ground, or anything far enough ahead to be used as a guide. Even in South Carolina or the Virginia mountains there is always a small road, trading post, or something on the map to check with.

The following examples take a pilot practically from coast to coast. It should be noted that nothing contained herein should be construed as disparagement of compass flying. A private pilot must learn to use and trust his compass but first he should learn to read and understand his map. Try any of the three examples below with the compass covered with masking tape and you'll find a new thrill in flying!

1. West Coast to Big Springs, Tex.

When the compass bowl broke, a few hours out of Tucson, the pilot stayed on his gyro-compass until he broke out of the overcast near Rodeo. A quick check located the sun approximately south and as the gyro had precessed and was no longer accurate, the pilot caged the instrument.

Orienting his map with the terrain, he located first the dry lake ahead, then the railroad. From then on he had nothing to do but follow it into El Paso. But he still kept his index finger on the route in order to know at all times where he was and where he could land in case of engine failure or emergency.

El Paso to Guadalupe Pass was easy: combination of highway and railroad, plus seeing the pass ahead. Then Red Bluff Reservoir, the Pecos River, and Wink, where he followed the road to Odessa. There a railroad took him on a bee-line to Big Springs.

The Washington, D. C., to Chicago route is sufficiently difficult to require considerable attention to detail. Upon leaving Washington the pilot oriented his map with the Potomac and headed west on his course, which lay along the 39th parallel of latitude.

The first check point, the small town of Herndon, was picked up eight miles west of the river, and U. S. highway 50 and Middleburg shortly afterward. Small towns are not easy to see unless the in-

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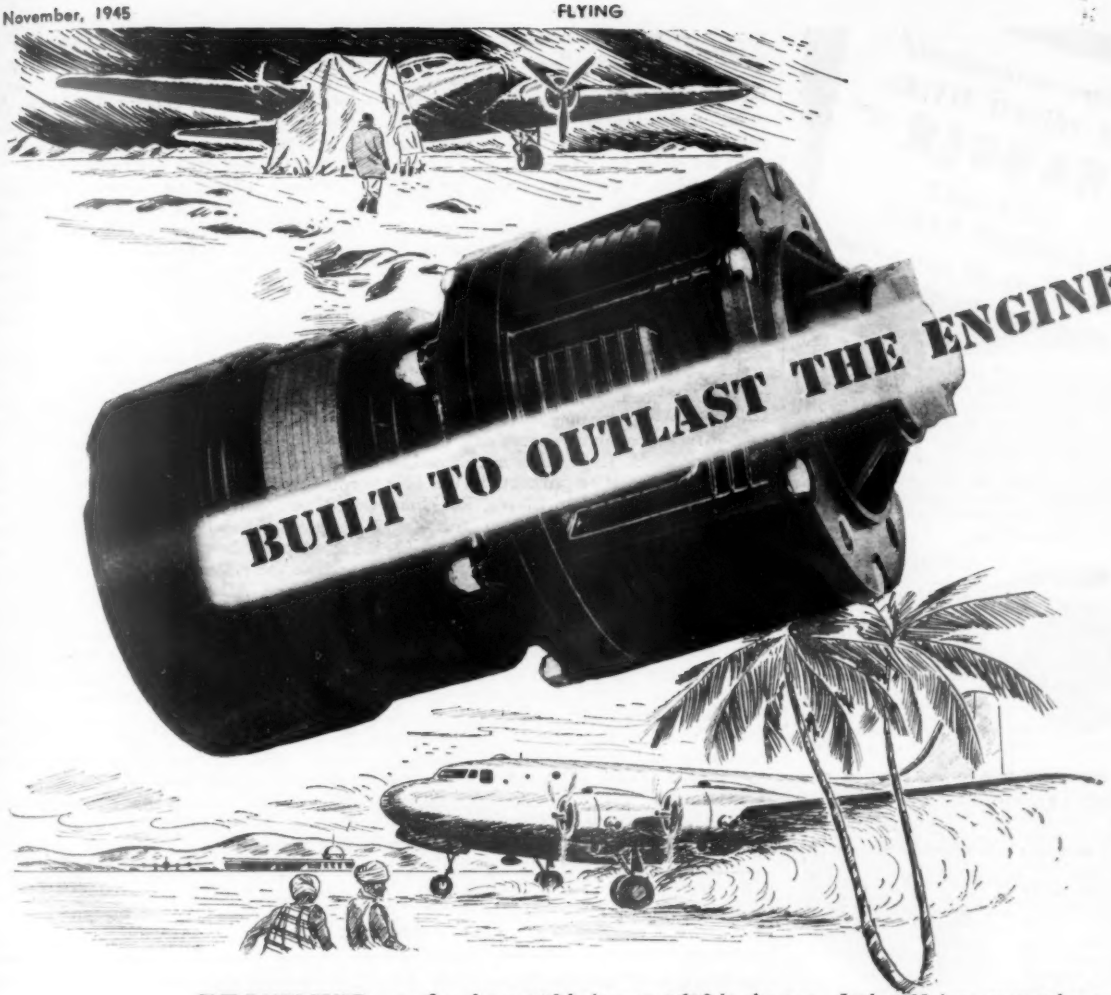

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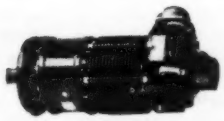

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The "117" is a dry-battery-operated 5-tube superheterodyne receiver of an entirely new design that offers performance never before possible in such a small aircraft radio. Mounts in 3" instrument panel opening. Specifications: Range, 195-410KC; Receiver size, 3 3/4" cube, weight, 1 lb. 12 ozs; Battery pack size, 2 3/4" x 2 3/4" x 6 1/2", weight, 2 lbs. 2 ozs.

MODEL 116

The "116" is a five-tube superheterodyne receiver providing selectivity and sensitivity of an extremely high order; it is powered by the Model 209 Transmitter. It serves as the remote-control for the "209" The "116" mounts on the instrument panel in a standard 3" opening. Specifications: Range, 195-410 KC; size, 4" x 4" x 6 1/2", weight, 2 lbs. 8 ozs.

MODEL 209

The "209" is a 12-volt transmitter of over 15 watts output. It gives trailing-wire performance with a fixed antenna. It is completely controlled through the "116" receiver. Dimensions: 7⅛" x 7" x 9" The Model 116 and Model 209 combination weighs less than 16 pounds completely installed.

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dex finger is kept constantly on the pinpoint—though even if lost, the Shenandoah River, about 55 miles out of Washington, offered the chance to reorient the plane and pinpoint the position accurately. A good thing, too, because the next 300 miles were tough.

The Blue Ridge Mountains and the Alleghenies are rugged. Once Front Royal and Strasburg are left behind, 35 miles of mountainous terrain must be flown over in which there are no check points except ridges, contours and valleys. On a cloudy day a pilot can be 90° off course and even with sun it is easy to make a 30° error in headings.

It is possible to fly straight by picking up small check points like a village of 500 persons on small roads: Perry and Lost River are good examples. Petersburg, on U. S. Route 220, a railroad, a stream, and with an airport, is the first good check point; then Elkins, Buckhannon and then, 80 miles farther, the Ohio River gives the best check of all—in fact, under conditions of poor visibility, it could well be followed all the way to Cincinnati!

Leaving Cincinnati however, is a problem: orient the map with the city and the river, then head the plane northwest toward Indianapolis until map, course and plane have a common axis or course line. From Indianapolis to Lafayette is dead easy but from there to Chicago is not so easy—check points are not numerous. But you couldn't miss Lake Michigan and from there on in it's a cinch.

From Washington to Atlanta is a grim route. More planes have crashed in this cross-country route than, perhaps, in any other. In the summer the dense foliage, absence of check points, huge distances, and the lack of emergency landing fields (the country is very rolling) make it imperative not to get lost.

There's only one answer: pin-point your map. Take off, orient the map, get the heading from the Potomac, and fly south toward Richmond. Cross the Rappahannock River and, if you like, follow U. S. Highway One all the way. Believe it or not, Richmond can be passed without even seeing it.

Just across the James River is a railroad passing through Bon Air. Take the railroad (Old Iron Mike!) and stay with it all the way to South Boston, then to Danville, and finally to Greensboro.

From 10,000 feet the remainder of the route isn't so hard, but from 1,000 feet and two miles visibility, anything can happen, especially in a lightplane. Two routes are offered: to fly the airways or to take the railroad via Charlotte, Greenwood, and Athens to Atlanta. The airway route is difficult and careful pinpointing is the only answer. If you want to be sure of getting there, use every available navigational aid including highways, railroads, and rivers.

If you can fly safely this way, you can fly even better with both compass and map. Add the radio and the highest safety factor has been added. In the last analysis, it's the map that counts in cross-country, but it takes brains and a good pilot to use it. END

What Do Pilots Want?

(Continued from page 50)

ous amount of private flying after the war."

"Believe market definitely limited unless need for other means of transportation to and from airfield is eliminated by helicopter or roadable plane."

"Expects to be able to sell 3,000 planes of pre-war type in first year after the war."

"Expects an unprecedented new market with flying clubs predominating unless price can be materially reduced, also a big increase in rentals. Is contemplating production of 5,000 a year."

"Privately-owned airplanes must be considered as purely luxury items and ownership limited to families with high incomes. However, any development significantly affecting the utility would materially alter the picture. Mass production possibilities for the helicopter."

"Contemplating a production of 5,000 a year. Favor flying clubs."

"Unless utility increases, post-war flying will remain much the same as at present, although on a considerably increased scale."

"The most optimistic view for private flying will require 166,000 airplanes to be produced in two years' time. This is based on estimates of 747,000 post-war private pilots."

"Flying in all its categories is destined to mushroom after the war to proportions we do not now dare to visualize. Expects a mass market for such innovations as the helicopter."

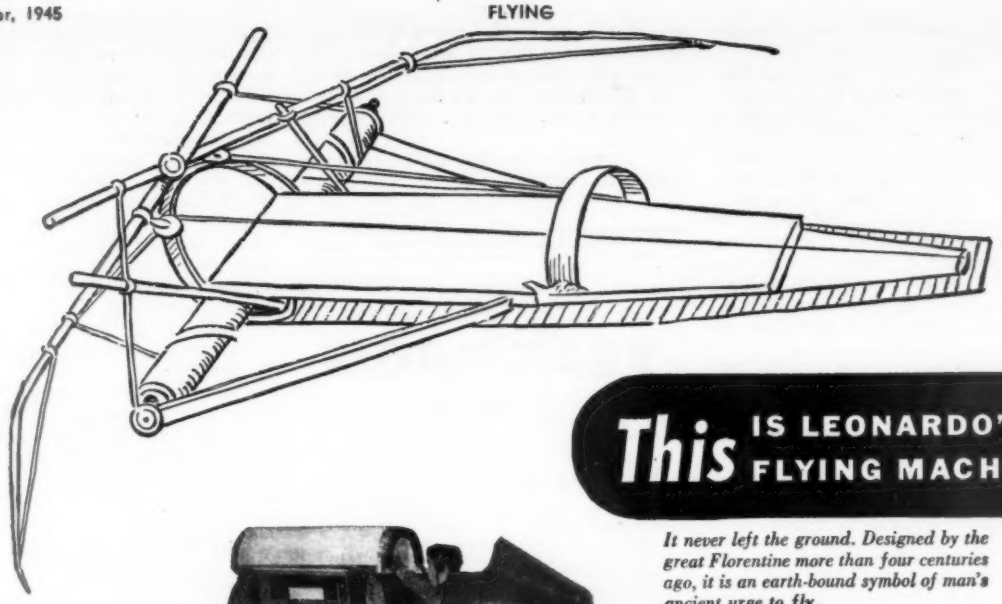
"Large swing to private flying after the war. Whether it will be sustained or die will depend upon cost and the type of regulatory measures imposed. The majority will find cost too great unless materially reduced from pre-war levels."

"Not much private flying after the war unless subsidized by the Government, because national debt will be so great everyone will have to be taxed to the limit."

"Returned war pilots will provide a tremendous market for the 'Fly-yourself-drive-yourself' system."

Another estimate of the volume of private flying comes indirectly from the airport builders, and there are two extremes here. The CAA estimates that an additional 3,000 airports, plus our existing 3,000, will meet our immediate needs and it may be assumed that Government is expecting private industry to add its pick and shovel to the airport-building job in addition to Federal-state co-operation. Against this conservative estimate, the Personal Aircraft Council of the Aeronautical Industries of America calls for 20,000 landing places for private flying.

Estimates are all right. They are the basis of business plans and manufacturing schedules. More important, however, are the factors that will affect private plane ownership. Here are seven,



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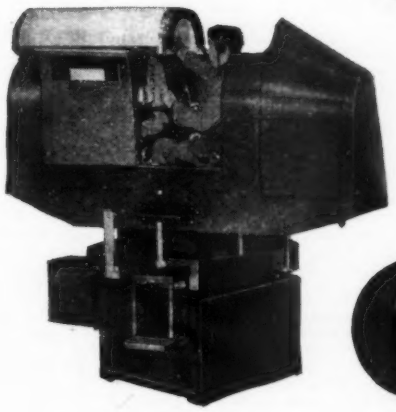
It never left the ground. Designed by the great Florentine more than four centuries ago, it is an earth-bound symbol of man's ancient urge to fly.



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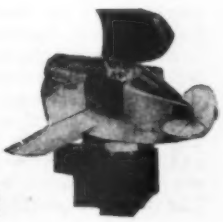

Link training is your first step into the **FLYING AGE**

each worth a chapter, but treated briefly as space dictates.

1. *Cost, utility and safety.* These three are grouped because they are inextricable. Because airplane usefulness is limited, they sell in limited quantity and small production means hand work and high costs. All too brightly the automobile stands out in contrast. It is probably our most useful piece of durable goods and we buy it by the million. Quantity production makes it cost less to make. Ford has said there will be 40,000,000 automobiles soon after the war. There are now only about 30,000 private airplanes.

The 2,800,000 automobiles sold in 1940 cost an average of $883 each. Of these 75 per cent were four-place. The 4,455 civil airplanes made in 1940, more than 90 per cent two-place, cost an average of $1,500.

To insure a $2,000 airplane the first year costs from $368 up, depending upon coverage, but drops considerably the second year. If the company finds out you are a private pilot, your life insurance rate is higher.

The same manufacturers who estimated future demand for the Geisse-Williams survey also commented on the types of airplanes and ground facilities required, and in the remarks of 21 of them reflections upon utility are evident. Seven of the 21 believe a roadable plane (call it flying automobile, if you prefer) is either necessary, desirable or say they are developing one as an angle of approach to greater utility. Nine favor, or are working on, helicopters. Ten plump for landing strips to make their airplanes more useful.

As to safety a majority of the manufacturers are seriously considering, if they have not already incorporated into their design, the non-spinning features which have been so widely discussed. Agreeing that there is danger in flying, manufacturers believe generally that the public will give this its proper weight in relation to driving a car, riding a train or pedalling a bicycle. Education is needed here.

Cost, utility and safety are the most important factors that will affect postwar sales. Given utility, very few of the other six factors to be considered would be worth much space. In fact, given utility, even cost would fade as an important factor.

2. *Landing facilities.* The cry today is for landing facilities, everything from flight strips along the highways to pleasant, comfortable airparks and air harbors. The manufacturers in particular say their planes will not be useful unless Government provides enough places for them to land. They overwork the analogy of the road and the automobile.

In the Geisse survey there was unanimity among the manufacturers on the need for more landing places. Actually, however, it is physically impossible to build airports everywhere that somebody wants one. Trying to do this to make the airplane useful is a weak makeshift. The solution lies in the vehicle itself—and at the doorstep of the manufacturers. An automobile travels on roads. The airplane ought to be able to go downtown or to its owner's front door whether or not there is an airport there.

We will have airports, many of them, and they will affect the sales of planes but they are far from an answer in themselves.

3. *Attitude of the Federal Government.* Geisse and Williams did not list Government regulations in their questions asked ex-airplane owners but so many of them said they had sold their planes because of regulations (4.2 per cent), that it was lifted from the miscellaneous reasons and dignified with a separate listing. Expense accounted for 50 per cent of sales and inconvenience for 15 per cent. This factor of regulations must be considered.

A new philosophy now underlies Federal regulations and eventually all of them may be based on it. From 1926 the Federal Government has tried to protect the public from the flyer and the flyer from himself. When this was extended into the private flying field many requirements became onerous. The new idea of the Civil Aeronautics Administration and the Civil Aeronautics Board, which writes the regulations, is to protect the man who pays for air travel and let the private flyer be responsible for his own safety.

4. *Groups interested.* Where is the market for airplanes? Most people mention first the 300,000 pilots in our flying forces when they have returned home. There should be added to these pilots the 2,000,000 individuals in the air crews and maintenance forces, all of whom have been subjected to intimate contact with the airplane and who may be presumed to want to fly when they get back. The amount of money they will have for buying such things as airplanes will affect their importance as a factor, but they are conditioned to flying.

Another group with little money but great interest, consists of the boys and girls who have become 18 years of age since the war started and who, thus, have not been able to fly. As many of them as can get the money or talk the money out of their parents will probably buy. In Washington, one small school operator now has 300 students.

There are 16,000,000 men and women in this country between 40 and 50 years of age. Some astute airplane salesmen are already concentrating on them. They are settled individuals, have more money, certainly, than the teen-agers, and they would make safer pilots. As converts to flying they would be more influential in their neighborhoods. Many of them have 18-year-olders in their homes who will fight for the salesman in making the sale. The polls have shown that these people in their forties do not know that they can learn to fly as easily and surely as the youngsters. They need education.

High school students are getting education. Thousands of them are learning the effect of the airplane upon their geography, political life, economy and social relationships. They will come out of school, many of them with flying experience already registered. They will not have money—but their influence will be felt at home.

There are many hundreds of thousands who have started to fly and then given it up. There are tens of thousands who learned to fly and have not been able either to rent time in an airplane or to buy an airplane. They are potential customers if their one obstacle, high cost, can be removed or lowered.

There are 1,000,000 two-car families in this country. For many years the aviation industry has been considering them fondly as their best customers but they have not yet sold one car to buy a plane.

There is one other group which is a good prospect: those who now own airplanes. The planes they own can be improved. They are expensive, and many owners find very little use for them except in casual pleasure flying. But the owners are innoculated with the virus of flying. Many, probably, are incurable;

15 YEARS AGO

FROM the November, 1930, issue of this magazine:

Professor Piccard of Brussels proposed an ascension in a specially-constructed balloon to a height of more than 10 miles to study cosmic rays, which he believed were given off by disintegrated atoms in outer space.

Chicago's National Air Races saw new records set with Ben Howard's tiny white monoplane; the Pitcairn-Cierva autogiro, flown by Harold Pitcairn, and a Laird racer, flown by "Speed" Holman in the $10,000 Thompson Trophy race. Holman's average speed was 201.91 m.p.h.

The U.S. Weather Bureau announced a new device called the "clinometer" which was used to determine height of clouds at night. The instrument made use of 250 to 500-candlepower searchlights.

New world record for long distance aerial photography was established by Army Air Corps when they photographed Mt. Ranier at a distance of 227 miles from a 17,000-feet altitude.

Controlled entirely by hand, a new German lightplane (an Arado) had side-by-side controls which eliminated rudder pedals.

H. B. Henrickson of the Bureau of Standards developed an electric ice-warning device. When aircraft entered temperature zones of from 28° to 32°, thermostatic device turned on warning cockpit light.

Navy Curtiss *Hawk* racer, entered in Thompson Trophy race, crashed, killing Capt. Arthur Page, the pilot. Plane had Curtiss *Conqueror* engine developing 800 h.p., was equipped with special wing radiators for engine cooling.

Florence (Pancho) Barnes, of San Marino, Calif., had just established a new women's speed record of 197 m.p.h.

Rocket planes capable of 25,000-m.p.h. speeds at altitudes from 30,000 to 50,000 feet were predicted for the year 1980 by Lloyd Stearman, president of Stearman Aircraft, Wichita.

The U.S. Bureau of Standards had developed a new machine to determine tensile strength of aircraft safety belts. Average belt tested about 700 to 1,200 pounds.

Better Mileage Than Your Car

Hans Groenhoff Photo

Many owners have flown their Cruisairs at the *extreme fuel economy* of 22 to 25 miles per gallon. Now comes the 1946 Cruisair—America's Economy Plane—with new additional war-developed features. Its modern design and attractive appearance will be augmented by all those characteristics of efficiency and dependability which carried Bellanca planes to so many world records over a quarter of this century. Get your name on file today for complete information. . . . Bellanca Aircraft Corporation, New Castle, Delaware.

BELLANCA *Cruisair*

BUY WAR BONDS

they would fall hard for a better plane. But they will never make an "industry" because there are so few of them.

5. *The people with the money in hand.* When the Crowell-Collier poll-takers queried people about their plans to fly after the war, they asked average and above-average income families and individuals, the upper 50 per cent of the urban population in terms of standard of living. Interviews were confined to families having at least $2,000 annual income or at least $1,000 in savings or both. Thus, the people they asked probably have been buying bonds, have some cash in hand, and are itching, perhaps, to get free of war's restrictions and spend it. They found there is an estimated market for 100,000 planes just as soon as these people can start spending their savings. Other major purchases they plan to make are houses, automobiles, refrigerators, radios. These are prospects, but there is a sobering consideration as well. Thirty-six per cent of those interviewed said they will delay purchase of a plane because they cannot afford it.

6. *Government promotion.* The Civil Aeronautics Act of 1938 empowers the Administrator of Civil Aeronautics to "foster and encourage the development of aircraft, aircraft engines, propellers and appliances." In 1935, under Eugene Vidal, the CAA tried to develop an airplane which the average man could buy and fly. The industry screamed its protest that prospective purchasers would never buy their planes, but would wait for the Government's "dream plane." The program petered out. The industry has been belittling it ever since in spite of concrete results that are unanswerable to this day. Here they are: In 1933, the industry produced two lightplanes. In 1934, one. In 1935, Vidal began to boost a plane for everybody. In that year, the industry sold 436, next year 889, and the next 1,523. In 1938 they sold 1,363, and in 1939, 3,029. In 1940, the last normal year, they built and sold 4,455. This seems a pretty good indication that interest in the lightplane was awakened along about 1935 and Geisse indicates the logical question is, "Who did it?"

There is another important development here. T. P. Wright, Administrator of the CAA, has thrust that agency more positively into the personal aircraft field by setting up an assistant in charge of development of the personal plane, and selecting a committee from the industry to advise with the CAA in its program. To a background of industry suspicion and questioning he announced that the CAA would give "an occasional stimulant" to the industry by assisting the development of better personal aircraft, as authorized by the Aeronautics Act of 1938.

"The most important plank in our platform for the proper advancement of personal flying," Mr. Wright said, "is the development of a private flyer's airplane vastly superior and less costly than any now known—an airplane worthy of the market." Details of this program have not yet been announced by John Geisse, who is the assistant in charge of planning.

In 1927 Congress authorized the Government to encourage the development of new ideas in aviation by establishing an Aeronautical Patents and Design Board authorized to make awards up to $75,000 for individual ideas that were considered to be of value to the Government in aviation. The board was to consist of the assistant secretaries of War, Navy and Commerce and it was required to refer new ideas submitted to the National Advisory Committee for Aeronautics for recommendations. If these recommendations were favorable the Board was to estimate their value.

Only one such award has been made since 1927.

It would appear inconceivable, says Geisse, that there would be no one in 16 years who would both want and be eligible for such an award. It would take a page or two of this magazine to list the good ideas that have needed such encouragement in that time.

The NACA has now announced what is apparently an important change in its policy. Dr. J. C. Hunsaker, its chairman, told the Woodrum Post-War Military Policy Committee that the NACA should endeavor to direct an increasing proportion of its research effort to the technical problems of civil aviation with a view to their practical solution. Application of the results of this research, Dr. Hunsaker said, is a function of the industry and the military.

7. *A different and better airplane.* The whole tone of the Geisse-Williams report is that today's airplane will not sell in quantity. They point to the statement by manufacturers themselves that increased utility is an essential. Polls, except some of those made by manufacturers of airplanes, back them up. The Crowell-Collier poll shows that 65 per cent of the civilians questioned want something other than today's plane. Twenty-six per cent want a helicopter, 39 per cent want a roadable plane, and 31 per cent will accept an orthodox plane. Significantly, 83 per cent will wait for the helicopter and 77 per cent will wait for the roadable.

The Geisse report also shows that most ex-airplane owners feel too much attention is paid to high speed. Twenty-two per cent said high speed received too much consideration. Too little attention, this poll showed, is given to comfort, low speed, and safety and ease of control.

Comfort involves the element of noise and Geisse, pointing out lessons he learned which were not all included in his report, says that nobody knows how popular a really quiet airplane would be because nobody has ever been in one. Very few planes, except those selling for above $10,000, are comfortable for flights of two to four hours for any but the smallest persons.

A different and better airplane would be useful to more people. It would be quiet, comfortable, moderately fast, safe and operable from a small field. It would be the most important actor in the whole picture of post-war sales. It would influence the purchasing plans of every group mentioned above. It would sell in greater volume, the vicious circle would be broken, and it could be sold for less. END

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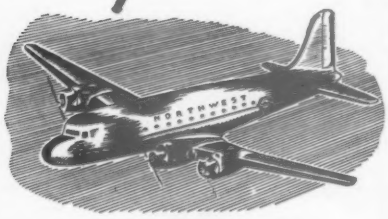

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Alaska—Frontier for Flying

(*Continued from page 28*)

familiarization with landmarks that count. Then you will be able to follow dog-sled tracks across Norton Sound between Unalakleet, Moses Point and Nome, or pick out some other marks as Sig Wien did when we were coming back from Kotzebue. He lowered the window of his 1928 Bellanca, throttled back, and peered with great intentness at a mountainside which to me was merely a white expanse of snow.

"Used to be an old she-bear lived right around here. She has three cubs every Spring. Thought I saw them for a minute, but I guess not."

The veteran Alaskan pilot, says Burleigh Putnam, chief, general inspection branch of the Eighth Region, develops tricks for his navigation problems. Some pilots insist flying in Alaska is simple—that you can't get lost. They suggest that if you fly downstream on any river you will always arrive at some sort of a settlement where, after landing on a sandbar, one of which is almost always available, you can get new directions and take off again. As to which direction a river is flowing in a country where they all look like agonized snakes from the air, the "bush" pilot has his answer ready. The current is too sluggish to make ripples, but a tree that has fallen into the stream is certain to be snagged with its roots upstream and its branches downstream. So, they say, you merely fly up a tree.

There are main airports or intermediate airports every 100 miles on almost all stretches of the airways, thanks to the CAA's early civilian program and recent war construction. Main airports in Alaska have at least one 6,000-foot, and intermediate fields, at least one 4,500-foot runway. Thanks to the demands of the Army, airport facilities now are present in a quantity and quality which no Alaska pilot has ever enjoyed before. In fact, the airports are so big that old time Alaskan pilots often land *across* the 500-foot-wide paved runways.

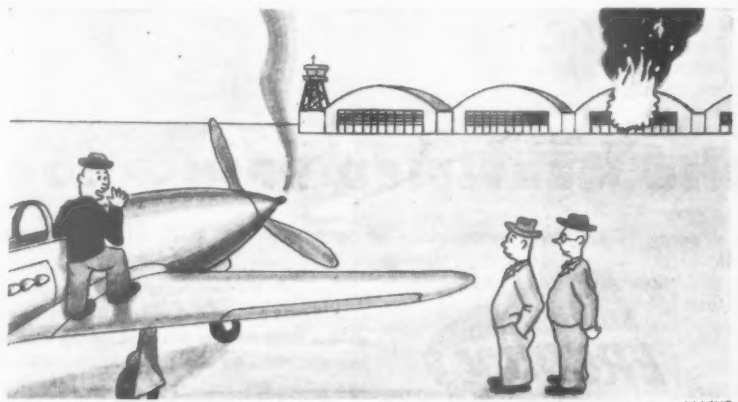
The absence of ground aids for contact flying makes the use of radio imperative, in the opinion of most Alaskan pilots. CAA's radio aids are ample for safe flying over all the airways. The communications system has produced hundreds of stories of communicators watching over pilots and rescuing them when they were forced down en route.

Putnam said: "During 1943 the CAA spent 230 hours flying after pilots who were forced down or in search of some we knew to be lost. Usually we find that just one such experience is all they need. Walking back over the muskeg, fighting mosquitoes—is an apt teacher. Walking back in the winter is not so bad. You can go anywhere up here with skis or snowshoes, and a rescue plane can always land near a downed plane on frozen ground. It is not nearly so easy in summer. You can get a plane down without injury to the pilot but it usually stays there until winter when the muskeg freezes and it can be flown out."

The best pilots have lapses in the important matter of reporting their flights, requiring the CAA watchdogs to get on their trails.

The remedy, according to Jefford and Putnam, is to instruct every newcomer on the Alaskan facts of life, check his emergency equipment and radio which the law of the territory requires him to carry, and keep a radio tab on every flight. These laws, in the opinion of other CAA pilots, Jim Hurst, Paul Miller and Harry Gray, should have more teeth in them. For example, a CAA inspector can ask the pilot if he has an emergency food allowance of 1,000 calories aboard for each passenger for 10 days; whether he has a gun; snowshoes in the winter; and two-way radio. If the equipment is not in the plane, the inspector can only warn the pilot, who then goes on his way.

These pilots say the best way is to come through Canada along the Alcan highway which is adequately supplied with airports for even the puddle jumper. Visitors would see some beautiful country en route, and land on fields amazing in their size and facilities. Entering Alaska at Northway, they would get their first taste of the kind of air facilities which the CAA built from nothing,



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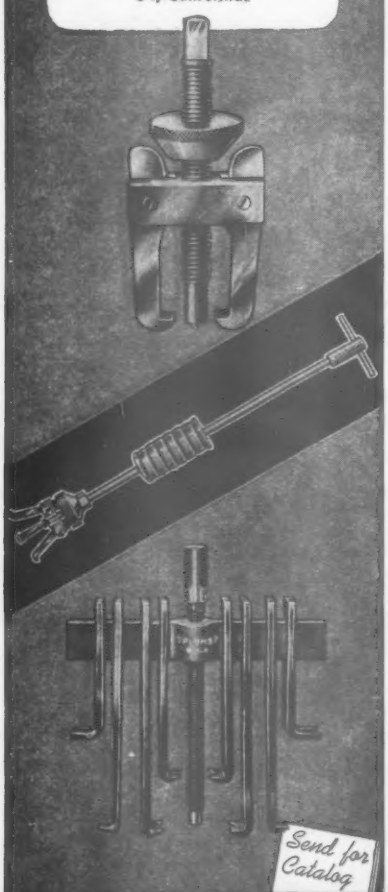

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and entirely by air. Today the Alcan adjoins Northway, but when it was located as a field site—the nearest "road" was 50 miles away. Hops along the coastal route north from Seattle are too long for small planes, but for larger craft this route is probably better. Gas capacity is what is needed here. The scenery is magnificent.

Where to go and what to see when flying in Alaska is of course the most interesting part of the story, and the CAA pilots there are the best advisers available. A consensus of their advice ought to satisfy the most exacting tourist. They suggest the visitor spend some time at major Alaskan towns such as Fairbanks, Anchorage, Juneau and Nome, making short flights from these bases to the points of interest.

Out of Fairbanks an interesting flight is to Fort Yukon, rich in historical associations and of gold rush fame. The most interesting flight from Fairbanks is down the Yukon, dropping in on such CAA fields as Tanana and Galena.

Flying on out to Nome, the tourist will leave the Yukon and fly over interesting Eskimo and Indian villages. History will beckon for many short flights, and in Nome itself there is enough of interest to use up a couple of weeks of looking and listening.

Up and down the beach at Nome lie the stories of the gold rush, thick as the dark brown sands from which you can still wash "colors." In shacks at the edge of town, and underneath their longboats tied up on the beach, are King Islanders carving walrus ivory. Three miles back of town toward the hills are great commercial gold dredges, one of them the largest in the world.

Around the shores of the Seward Peninsula, reaching out toward Siberia, are Eskimo villages unspoiled and little changed over the years. The one change is that they are familiar with the gasoline engine, even to the point of using green willow twigs as substitutes for piston rings in an emergency.

It is not true that the bathrooms in Nome have bear fur-covered seats, but you will see the "honey man" driving through the streets on a rubber-tired wagon, and water pipes lying on top of the ground in summer to carry the drinking water that is dispensed by truck during the winter.

With a base at Anchorage, some exceptional flying scenery is available for the aerial tourist. Fly in some night in early summer at 10 or 11 p. m. and see Mt. McKinley towering into the colorful Alaskan sky, a little more than 135 miles away.

Hop off from Anchorage for McGrath through Rainy Pass, northwest about 115 miles. The mountains tower to 8,000 feet on either side of the pass, the floor of which is 3,000 feet high. At several places the pass seems to run into the blank wall of a mountain, but a right angle turn opens up another new and narrow vista. At McGrath, 220 miles northwest of Anchorage, you are at the aerial crossroads of Alaska. It is an old river town, has been an important military post, and after the war will be as picturesque a spot as any in the territory. On to Lake Minchumina, 120 miles northeast of McGrath, one of the gems of CAA stations in Alaska, and not far from Mt. McKinley.

Mt. McKinley National Park is a tourist must, and the mountain itself will challenge any pilot. To the right plane, the mountain will yield its loftier views. If you have a ceiling of 21,000 feet you can look down on its snowy summit, which often wears a blowing cloud cap. The field at Mt. McKinley Park, now used by the Army, will be available for civilian use.

At places like McGrath you put up for the night in a roadhouse. This is Alaskan equivalent for hotel, and while the service might not be of hotel quality, it is adequate and enjoyable. Food is plentiful and of surprising variety considering the dearth of fresh vegetables throughout most of the year. Alaskans are great meat eaters and even in wartime they spoke of steaks with strange familiarity.

A room at a roadhouse will cost an average of $4 a day. Breakfast costs between 50 cents and $1.25; lunch around $1 and a steak dinner from $1.50 to $3. Prices at McKinley Park Hotel are higher.

In an emergency only—and don't plan on making a habit of it—you can "put up" at a CAA station at airports where there is nothing around but CAA homes and workers. Company is always welcome at remote stations, and you'll be fed and bedded down in generous American style.

Coming back, fly through Ptarmigan Valley instead of Rainy, or Simpson Pass, and get a startling contrast. Ptarmigan Pass was put there for the lightplane flyer. The high point on its floor is 3,000 feet, but it is generally level and much wider than the other passes. The route is a little longer but when you fly down closer to the ground in safety and startle moose, bears and caribou below you, and when you move over closer to the crags at certain points and see mountain goats

It's Expensive to Tour Alaska

	Double Room	Single Meals	Gasoline per gallon	Tie-down or Storage	Mechanics Hire	Taxi to Field
Juneau.....	$3.50 to $10	.60 to $3	.26	$1	$2 to $2.50 per hour	$3
Anchorage....	$5 to $10	.60 to $3	.38	$1		$1
McKinley Park.	$6 to $12	.70 to $4	None	$1		None
McGrath.....	$6 to $8	$1 to $2.50	.36 to $1.25	$1		None
Fairbanks.....	$5 to $10	.70 to $4	.38 to .40	$1		$1.25
Nome.....	$5 to $10	.50 to $4	.36 to .45	$1		$1.25
Kotzebue.....	$6 to $8	$1 to $2.50	.36 to $1.25	$1		None
Pt. Barrow....	$4 to $8	$1 to $2	.36 to $1.25	$1		None

Note: These are today's figures. They can only be used as a rough guide for future estimates.

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HERE'S the fastest traveling, highest climbing, heaviest armed, most maneuverable "eye" the Navy has ever had! It's the Curtiss *Seahawk,* versatile one-place scout whose specialty is pinpointing enemy ships and shore installations for naval attack.

The Seahawk can even sock them itself for it carries both depth charges and bombs.

Paradoxically, this swift bird of prey is all set for missions of mercy, too. Rescue work is facilitated by bunk space in the fuselage.

With twice the speed, nearly three times the horsepower and many times the firepower of any airplane in its class, the *Seahawk* is another Curtiss-Wright contribution to a vastly superior Naval air arm.

From now on, the Navy's way of saying "I'll be seeing you" will be to catapult a Curtiss Seahawk into the skies.

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MISSION OF MERCY: With its extra horsepower and fuselage bunk space, the SEAHAWK facilitates rescue of men forced down at sea.

MISSION OF DESTRUCTION: The SEAHAWK can deal out punishment. This new plane carries depth charges. Under each wing is a bomb rack.

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and sheep, the extra distance is forgotten.

Devote one day to a flight to Illiamna, 210 miles southwest of Anchorage, one of the most interesting spots along the airways. Fifty yards from the CAA quarters there is a stream where 18-inch rainbow trout are plentiful. Lake Illiamna, 70 miles long, and Clark Lake, 30 miles long, are internationally known to fishermen. En route is another breath-taking pass between mountains 8,000 to 10,000 feet high.

For variety in scenery, head south out of Anchorage over the Russian River high ground, just 50 miles away, where hunting and fishing are unexcelled. For more scenery, hop over to Prince William Sound, where green islands dot the incredibly blue water, and return by way of Seward and the Kenai Peninsula a flight of about 250 miles. Or, turn left over the sound and return by way of Palmer and the Matanuska Valley, about the same distance. A short trip is that west of Anchorage to beautiful Chackachamna Lake, through another inspiring pass, Merrill, 115 miles away.

Juneau, 500 miles down the coast from Anchorage, which facetious Alaskans say is a suburb of Seattle, is the base for seeing the inspiring and beautiful coast of the Gulf of Alaska. Wide beaches can serve as landing spots up and down this coast and aerial visitors should get more from the scenery than the surface travelers who have praised the beauties of the "inland passage" for years. Just over the hill from Juneau the mighty Yukon starts, and a short flight distant is Chilkoot Pass made famous in gold rush days.

While the view of a glacier from the ground is interesting, and the ice caves in the beautiful Mendenhall Glacier at Juneau are deservedly world famous, still the way to see these phenomena is from the air where you get the feeling of motion in a glacier since you see it as a flowing stream of ice eating away at its banks and pushing debris ahead of it.

These are but a few of the flights where completely adequate fields are available. A visiting pilot could spend an hour talking with any group of Alaskan pilots and turn up another score of destinations and flights of tremendous interest to any newcomer. He can also see pictures of planes resting on "impossible" landing places where they have been put by the rugged "bush" pilots of the Territory.

Skis are best for winter flying, and floats will do for almost any of the trips described here in the summer. The important point is to have sufficient excess lifting capacity to carry the emergency equipment without which a careful pilot does not fly in Alaska. END

IATCB—Air Traffic Trouble Shooters

(*Continued from page* 29)

sometimes leads into fields entirely unrelated to aviation or war production. Such an instance occurred a year or so ago during a study of how the Navy, the Air Forces and the Army Ground Forces could all use a large area of the Gulf, near Horn Island, for gunnery and bombing purposes.

As the IATCB members neared solution of the ticklish problem, Congressmen representing some of the Gulf Coast states began to send in "you-can't-do-this-to-us" telegrams and the Department of the Interior added its protest. It seems that the military had inadvertently designated as part of the gunnery range coastal waters containing millions of dollars worth of shrimp. The IATCB solved that one by recommending a site well outside the waters plied by the shrimpers' trawlers.

Although the IATCB has wide discretionary powers and virtually complete control over all non-military aircraft operations, it can issue no arbitrary rulings. Its recommendations are arrived at by the democratic process of placing disputants across the table from each other and letting them "talk it out." Such table talks seldom fail to work out compromises satisfactory to all groups.

Occasionally an issue is resolved by a recommendation which, although supported by unanimous vote, draws sharp criticism. For example, there was the case involving control of civil flying in the Western Air Defense zone.

Early in the war, the ban on civil flying on the west coast was accepted without question because it was a step dictated by military security—by the obvious need for a defense against air attacks, espionage and sabotage. Subsequently, the concentration of Navy and Army manufacturing and training facilities in that area, plus the ever-present possibility of enemy attack from the sea and air, emphasized the necessity of maintaining tight control of coastal air space.

In January of this year, however, the Western Defense Command issued a new proclamation, with the concurrence of the Western Sea Frontier (Navy), relaxing some of the rigid controls which had been in effect since Pearl Harbor. The move was initiated by the CAB member of IATCB. Civil flying training was permitted outside prescribed danger and special danger areas in the zone when approved by the IATCB after application to the regional manager of CAA. Also possible, within limitations, were flights of Government, agricultural and certain photographic planes. Air carrier operations continued unrestricted flights as in the past.

When the Defense Command proclamation was sent to the IATCB for approval, the four-man board suggested a broadening of the paragraph covering movements of "miscellaneous" civil aircraft. The paragraph stated in substance that point-to-point flights would be sanctioned if they were in furtherance of the war effort and are cleared through CAA. The clearance included the filing of a certificate of necessity and a flight plan. All civil flights could, however, be prohibited whenever the Western Defense Command considered the military situation warranted such a step and notified

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the IATCB in advance of such action.

The IATCB suggested approval of point-to-point civil flights when they "were in furtherance of the war effort, or in the public interest, were conducted in accordance with military and civil regulations and did not interfere with military operations or jeopardize military security." The Command declined to accept the suggestion and the IATCB finally approved the paragraph as it originally was written. The military was reluctant to permit personal aircraft to roam unchecked in an area so important to the war effort.

Failure of the IATCB to demand a more liberal Army-Navy proclamation produced many protests among private aircraft owners and fixed-base operators on the west coast. The almost complete lifting of the ban on the east coast last October also rankled in the minds of far westerners who questioned the need of continuing such stringent regulations on the west coast in the light of the brightening war picture.

But military authorities pointed out that the west and east coast situations were not analogous. While the war in Europe was over, the Pacific war was still to be won. The problem of redeploying European forces to the Pacific theater made the west coast a vital defense area and, therefore, one in which non-military flying had to be controlled.

The IATCB on August 27 issued an order, effective concurrently with the VJ-Day proclamation, rescinding all controls over civil flying in the Western Defense Zone and Vital Air Defense Area. The order also directed that the Western Air Defense Area be eliminated from aeronautical charts and publications containing aids to air navigation.

Many of the IATCB's recommendations are of temporary benefit; others have brought about permanent changes in flying regulations and services. A typical case in the latter category was the recommendation on standardization of airport symbols on aeronautical charts. The CAB requested a study of the problem and in 1944 a set of symbols acceptable to the Army, Navy, ATC and CAA was drafted. A few minor revisions have since been made. The symbols are simple, require a minimum of interpretation.

Routine duties of the IATCB include studies of applications for permission to install aids to navigation (such as fan markers), and determining policies (such as the one governing establishment of practice radio range facilities). It also takes care of such items as requests from civil operators for authority to begin flying activities in sections of the country where there are no military installations. It is now routine for the Coast and Geodetic Survey to submit to IATCB maps and approach charts which must carry up to date information.

The presence of war installations in one area, Philadelphia, resulted in the closing of the municipal airport serving the city and adjoining communities. A site for a new landing field was chosen and the Government aided in financing its construction. End result will be that Philadelphia will have two airports instead for their post-war use.

The IATCB's value as a co-ordinating agency for all matters affecting any phase of military aviation has saved the Government many millions of dollars, particularly in the selection of sites for gunnery and bombing ranges. In that connection, routine clearing of proposed sites has enabled the IATCB to protect valuable cattle on western grazing lands.

Civilian flying has suffered, but it has been pointed out repeatedly that the United States is the only nation at war where private flying has not been completely grounded. One of the earliest tasks of the IATCB, before it was given its present authority, was to prevent such a blackout on private flying. Before the IATCB moved into the picture, every manufacturer considered the air over his plant to be a danger zone and shooting orders were issued to guards at many places. The situation might have become chaotic if the IATCB had not won approval of a proposal to establish local flying areas throughout the nation. The essence of that proposal was that private flyers were told where they might fly, rather than where they should not fly, to avoid danger areas.

Key to the whole IATCB operation is the office of the secretary, Lieut. Col. J. B. Hartranft, Jr., who maintains a cross-index of all cases reviewed, testimony taken and the action recommended in each individual case.

Lieutenant Colonel Hartranft and his staff receive cases to be studied by the IATCB, assign case or key numbers,

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summon witnesses, schedule hearings and disseminate recommendations. He also serves as secretary of technical subcommittees which in many cases hold preliminary meetings to prepare recommendations.

Membership of the IATCB now includes Col. J. S. Marriott, Army Air Forces; Comdr. L. E. Nivling, Office of Chief of Naval Operations; A. S. Koch, Assistant Administrator of CAA, and David E. Postle, Civil Aeronautics Board. There are seven regional committees with headquarters in New York, Atlanta, Chicago, Kansas City, Fort Worth, Los Angeles and Seattle. The committees conduct hearings at points where conflicts originate and where first-hand knowledge is valuable to subsequent IATCB disposition. The committees also may initiate cases.

The IATCB has disposed of more than 4,300 cases in the past two years and its case load is increasing steadily. With civilian flying on the upsurge, it is expected to handle its biggest load in the coming year.

Sub-committees of IATCB currently are attempting to standardize instrument approach control procedures, and it may be one of the most difficult of many problems submitted to the Board.

Another problem confronting IATCB is that of establishing a universal altimeter setting. In that direction, the board has decided to appoint a committee to study the project and recommended this procedure pending the committee's report:

1. That all continuously-operating airways communications stations broadcast the current local altimeter settings on half-hourly schedules.

2. That all aircraft flying "on airways" or "off airways" use the latest altimeter setting received from the nearest airways station to the route of the flight.

3. That all altimeters be checked regularly against field elevation and repaired by an accredited instrument shop whenever there is a difference of more than 60 feet.

4. That all aircraft monitor the scheduled half-hourly broadcasts.

5. That CAA include in Part 60 of Civil Air Regulations, definitions of altimeter setting, cruising altitude and terms.

6. That CAB issue a bulletin for pilots giving information regarding correction of altimeter indications for deviation of air temperatures.

The IATCB also recently approved standardization of the instrument low-approach systems (localizers, glide path and marker beacon type) of the Army, Navy and CAA.

The re-location of military bombing ranges, firing ranges and testing grounds will continue for many months, and whenever such installations conflict with Federal airways, the IATCB will be consulted for solution. As in pre-war days, certain caution, danger and prohibited areas will continue to exist.

Established as the Interdepartmental Committee on Air Traffic in August, 1940, the board began to function before the United States entered the war and its duties have expanded steadily. Its name was changed to IATCB early in 1941.

In March, 1942, President Roosevelt wrote the Secretaries of War, Navy and Commerce and the Chairman of the CAA, suggesting the position of the IATCB might be strengthened by the creation of regional committees, a step which was taken. Soon afterward the duties and authority of the board were outlined and case procedure was laid down. The IATCB now operates under the so-called "memo agreement," issued April 1, 1943, and revised with presidential approval on July 5, 1945. It was an agreement signed by the three secretaries and the chairman of CAA. No expiration date was set for the agreement and it can continue operations after the war. END

Navy Air Lab

(*Continued from page 59*)

illuminate 20,000 homes. Its pumps can supply water for a city of 70,000.

NAMC makes or has jurisdiction over private contractors who make all catapult and arresting gear replacement parts used on our carriers. It has the only school for training Navy personnel in the operation of catapults and arresters. From its parachute shop last year came more than 15,000 canopies, many of them tested by being hooked to dummies and dropped from the substratosphere.

Actually NAMC consists of four major branches: the Naval Aircraft Factory, which since its founding in 1917 has produced thousands of planes of more than 30 different types; the Naval Air Experimental Station, which moved to Philadelphia from Washington in 1924; the Naval Air Modification Unit, located in a former Brewster Aeronautical Corp. factory, and the Naval Air Auxiliary Station. This branch has among its assets an airport for landplanes and seaplanes called Mustin Field, in honor of the late Capt. Henry C. Mustin, Navy air pioneer.

In the cavernous concrete-roofed hangars one can see the fuselages of *Corsair* fighters being dropped from high racks, then picked up and dropped again and again. In laboratories, goggled and masked men pedal stationary bicycles while sucking on oxygen tubes.

Here new types of super-horsepowered engines, bolted to steel girders, spin oversized propellers for hundreds of hours without interruption. Jet propulsion (Jato) kits are assembled in quantity lots. From rooftops, atmospheric balloons rise into the sky; inside Arctic-temperatured rooms, other balloons are coated with ice while men jab instruments into the rubber to see if it remains porous.

NAMC's commanding officer is tall, square-jawed Rear Adm. Donald Royce, USN, who has been in Naval aviation since 1921. He is a brother of the Army Air Forces' famed Maj. Gen. Ralph Royce.

Recently NAMC completed a major contract for the construction of *Catalina* flying boats. These planes carry the designation PBN—the "N" indicating Navy construction as contrasted with the "Y"

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in their counterparts, the PBY planes built by Consolidated-Vultee. Admiral Royce says that problems faced in the building of the *Catalinas* are typical of those with which NAMC wrestles.

At the outset it was decided that the *Cats* could stand more fuel capacity, so the wings were redesigned to take larger tanks. Then more firepower was required; so, by altering the bow, NAMC put more armament aboard. Because of the added weight, it became necessary to enlarge the wing floats.

Performance tests showed that the changed bow tossed up a heavy spray and that the additional weight impaired stability. The solution: another change in the bow lines of the hull and a new type of tail.

When all modifications had been completed, the PBN *Catalina* was quite a different airplane from the original version and well able to handle the toughest patrol and bombardment assignments.

Admiral Royce, at one time stationed at Wright Field as Navy representative, says the principal difference between NAMC and Wright Field is that NAMC builds planes and does other manufacturing whereas Wright Field is essentially an experimental and testing operation base.

So far as is known, Wright Field has nothing exactly like NAMC's deck barrier test. The purpose of a barrier—which is nothing more than a series of steel cables stretched between stanchions on a carrier's foredeck—is to halt planes which overshoot a landing. Without the barriers, planes might plummet into the sea or into other aircraft parked near the bow.

Ordinarily only obsolete or otherwise expendable planes are sent into the experimental barrier. Many *Buccaneers* have made the fateful run. Recently a two-engined Grumman *Tiger Cat* fighter cracked up during a routine landing at Mustin Field. The plane was repaired, given a set of old engines and shot into the barrier. One of the engines was ripped off by the impact. As a result, stronger mountings were recommended to the manufacturer.

In all barrier tests the planes are pilotless. Tieing the controls keeps them on course and on the ground. Sometimes, when there isn't an expendable plane handy, a tricycle-geared steel wagon is weighted with sandbags and hurled into the cables.

Flyers who assaulted the enemy with *Hellcat* fighters can thank NAMC, in part, for the great structural strength built into the bellies of the Grummans. In the middle of Mustin Field there is a reproduction of an aircraft carrier flight deck. It has regular arresting gear, operational officers, etc. When one of the early *Hellcats* hit the arresting gear, the fuselage came apart.

The front of the plane went bounding across the field, while the rear of the fuselage, containing the landing hook, clung to the arresting cables. Given details of the mishap, the manufacturers added extra strength where it was needed.

Great smoke clouds, billowing out across the Delaware River paralleling Mustin Field, usually indicate that NAMC is showing crash-control crews how to douse a fire. During these demonstrations trainees are told that the primary concern is to save the pilot's life.

A dummy is placed in the cockpit. Gasoline is used to saturate the plane. Then a lighted torch is thrown onto the fuselage. As the fire flares, several chemical hoselines, spraying foamite, are played on the cockpit to keep the pilot (in this case, the dummy) cool. Other hoselines strike at the flames themselves. Usually the fire is out within 60 seconds.

Philadelphians living near NAMC—especially its modification unit in suburban Johnsville—have become used to odd-looking aircraft overhead. They may have a double nose or strange bulges around the fuselage. Many planes are painted red or yellow as a warning to other aircraft to stay away. It is commonplace for a comparatively small Curtiss *Helldiver* to buzz into view towing a disabled amphibian or some other plane from as far away as North Carolina.

Like Admiral Royce, who flies his own plane, the other top officers at NAMC spend almost as much time aloft as on the ground. Recently the Coast Guard flew a helicopter into the modification unit to be fixed up for sea rescue work. Someone was needed to hold a rope and be hauled into the 'copter as it hung in the air. Peppery little Capt. Ralph S. Barnaby, head of modification, spoke up and said he wanted to hold the rope. So the rope was handed to him, and up he went.

Captain Barnaby is an old-time glider pilot. He built his first motorless plane in 1909 and later was granted the first license issued in this country by the Federation Aeronautique Internationale. In 1930 he dropped in a glider from the dirigible *Los Angeles*, becoming the first man to perform such a stunt. One of the books he wrote is the Navy's "bible" on glider construction and operation.

His modification unit gets its experimental hand into just about everything new tried by the Navy Bureau of Aeronautics. In the aviation business it frequently happens that improvements appear between the time a contract is let and the time when the planes start off the production line. In order not to interrupt manufacture, the planes are accepted as originally specified and then are flown to the modification unit to have the latest developments added.

Early Grumman fighters were flown there to have heavier machine guns put into their wings. *Corsairs* were sent there for special superchargers to get them well above the *Zeros'* ceiling. On a rush order not so long ago 500 planes were rushed through. During the height of that project, fighters were lined up almost as far as the eye could see.

A major problem in the development of night fighters was the concealment of engine exhaust flame.

At the request of the British, NAMC set to work. Within two months there was produced a device that could withstand temperatures up to 1,500° and which hid the flame. Today, without diminishing aircraft power, those flame dampers, each weighing 31 pounds less than previous devices used by the British, are on all Navy night-flying planes.

NAMC introduced the powder, called soluble sodium salt of fluorescein, for spreading on the water after an emergency landing or other mishap. Previously the material for such purposes had been a metallic powder of aluminum and bronze. It was practicable except that it contained critically short materials. NAMC's substitute was ridiculed, at first, because its color was an off-green which the doubters said looked too much like the sea background to be seen readily from the air. But NAMC's product has proved superior to the original sea dye.

One of the largest jobs handled by the Center before World War II was the designing and construction of the dirigible *Shenandoah*, America's first sizable airship. The aircraft factory also pioneered in the development of long-range patrol planes; in the conversion from wood to metal as an aircraft material, and in the production of catapults.

A majority of all aircraft power plants developed in America in the past 28 years have either passed through or originated in the Philadelphia laboratories. NAMC

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developed the present method of calibrating engines under simulated altitude conditions and contributed to perfection of the floatless carburetor which enables a plane to fly inverted without the engine gasping for air and fuel. From NAMC also have come the Navy's precious pelorous drift sight and photo-cell automatic pilots.

Among the planes from NAMC are those whose designations are but a dim memory. There was the old C-1, a two-engined biplane flying boat, notable chiefly for its bulldog nose. There were the F5L, the SA-1, NC-5 (three-engined biplane flying boat), XOSN-1, XLRN, HS-3, MF biplane flying boat, TG-1, VE, NO-1 and others.

One afternoon a Navy transport plane landed at Mustin Field and, almost before it had braked to a halt, out hopped a rotund, red-faced officer. He was Capt. Dixie Kiefer, 60-times-wounded hero of the movie "Fighting Lady." He has been Admiral Royce's friend since the days when both were assigned to the flying school at Pensacola.

Kiefer dropped in to tell Royce that catapults from NAMC had probably saved Kiefer's carrier from a fatal attack when Jap bombers struck at her off Formosa last January. As it was, the flattop was damaged, but because the catapults got her fighters aloft fast, further attacks were driven off. That was but one of the countless accomplishments by which NAMC helped speed victory in the air war. END

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Handling the Seaplane

(*Continued from page* 45)

at the bow of the floats begins noticeably to increase and at speeds of perhaps 15 m.p.h. it reaches a peak in the average small plane, though, of course, the exact speed of maximum bow spray may vary considerably. With further increase of speed the total spray may increase still further but it will not strike the propeller because, with the stick held all the way back, the bow of the floats will have lifted far enough out of the water to put the spray definitely back of the propeller. It is obvious, then, that one ought to taxi a floatplane either very slowly or quite fast. And pilots who complain of spray trouble with propellers usually have been ignorant of the simple fact or guilty of ignoring it and have been merrily taxiing about at the worst conceivable speeds.

Probably the most important basic principle involved in the water handling of seaplanes is their weathercock action. It is related to and responsible for another rule calculated to avoid difficulty under windy conditions—*never use power when turning into the wind.* Conversely, the rule dictates applying power in turning out of the wind or maintaining anything but an approximate upwind course. It should be noted here that weathercock action is decreased by the use of widely-used retractable water rudders and all maneuvers discussed herein are presumed to be made with such rudders in the down position (in the water) unless otherwise noted.

As a practical example of weathercock action and the methods of controlling it under fair-weather wind and water conditions, let us assume that the engine is idling and all controls in neutral—a condition which in the first place inherently fixes the plane as heading approximately into the wind. Suppose that full rudder is applied to the right or left. The plane will swing off momentarily for perhaps 10 or 15°, but it will soon tend to return to a position more nearly into the wind. If the throttle is opened slightly, however, the turn can be continued properly and easily until the plane reaches a full downwind position, or any intermediate course can be followed. Moreover, if a right-hand turn is made, for example, and the plane is first swung as far as possible to the left with an idling engine, and if full rudder and a little power is applied after the plane commences to swing back through the upwind position the momentum of the weathercock action can be used to diminish appreciably the radius of turn. Some planes turn more easily in one direction than another, a condition which can be determined only by trial, though with clockwise engines the easiest turn usually is to the left.

Occasionally a pilot will notice excessive spray and sometimes may find it exceedingly hard to handle the plane as he wishes. Some planes, of course, respond more easily than others. In most cases, however, if a pilot experiences difficulty in taxiing it is likely that he has underestimated the strength of the wind. In this event it is inadvisable to force the craft with additional power. The wiser plan is to cut the throttle, idle into the wind, and make a fresh start, waiting perhaps for a lull or slight shift in the wind. If difficulty continues, it is advisable to shift to the technique of "step turns," or even "sailing," fully described next month.

Having successfully made the turn out of the wind as described above, the pilot probably can throttle the engine somewhat if he intends to follow a downwind course but it is essential to use sufficient power to maintain ample steerage. On a crosswind course he will have to use more throttle than when going directly downwind. Crosswind or downwind, though, he must adjust power and rudder to retain a safe degree of control, bearing in mind the fact that the craft will be striving constantly to weathercock into the wind and that, if the course is to be shifted to a more upwind direction, it is necessary only to ease off the throttle in order to reach it. Obviously, if the pilot wishes to turn completely into the wind, he need only close the throttle completely. Rudder in the wind direction will accelerate the turn after the throttle has been closed, though it is not essential. Conversely, the use of power not only will lengthen the radius of the upwind turn greatly, but will set up a capsizing moment which might prove serious under anything but ideal conditions.

It is important that this capsizing tendency be clearly understood.

When the pilot allows his plane to weathercock into the wind from a downwind course with motor idling, for instance, its forward motion is negligible, it rotates rapidly about its own center of gravity, and the only capsizing force is applied by the wind as the plane swings through the crosswind position. If the pilot uses power, however, with its resulting forward speed, centrifugal force can set up a powerful capsizing effort the instant the rudder is applied and this force is naturally enhanced by the wind. Furthermore, the list of the airplane as developed by these forces, will tend to bury the float on the outer side of the turn, causing drag and a powerful resistance against following the desired course and calling for more rudder and more power in an effort to overcome it. If the pilot persists and the wind is strong enough, the wing on the outer side of

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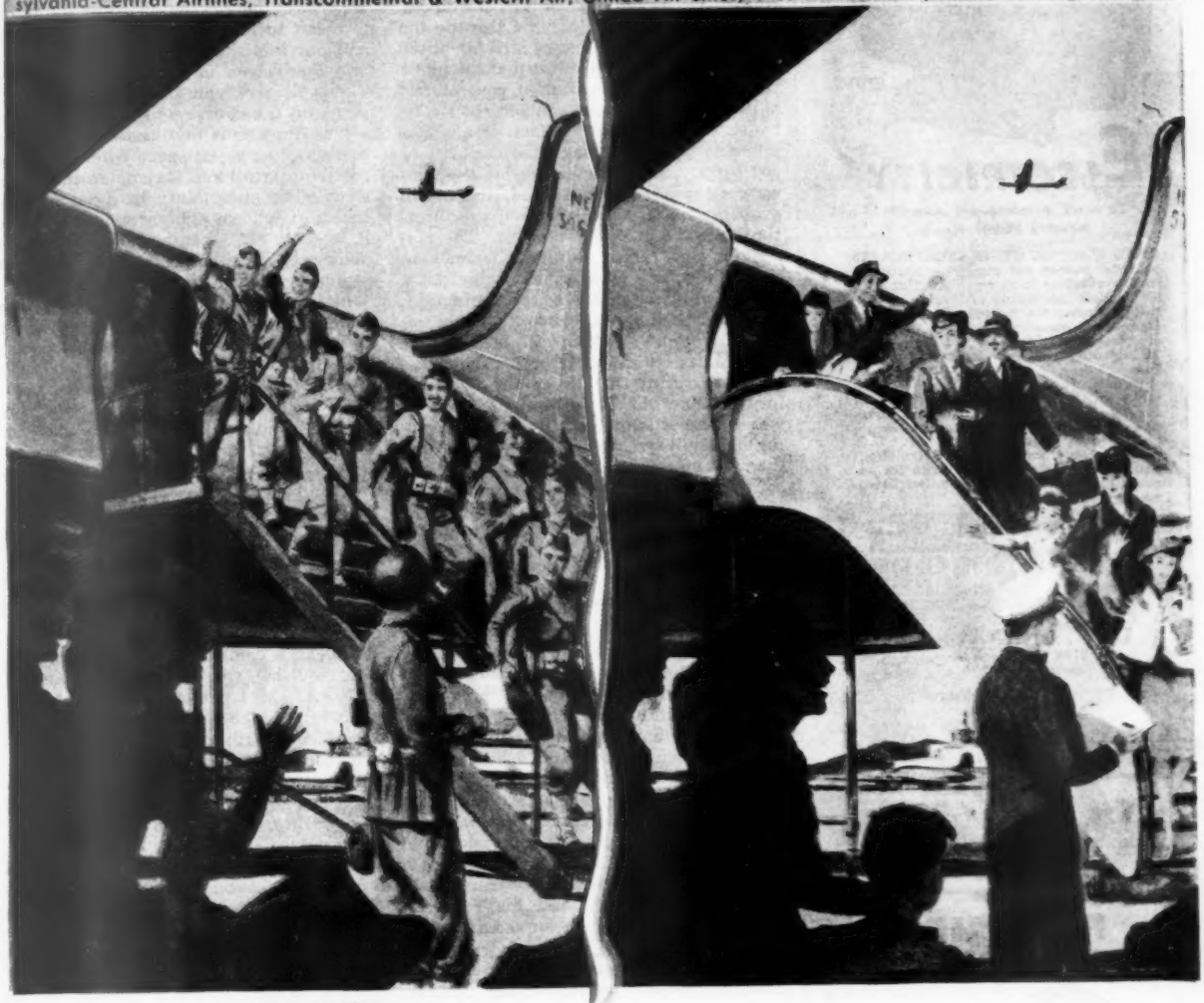

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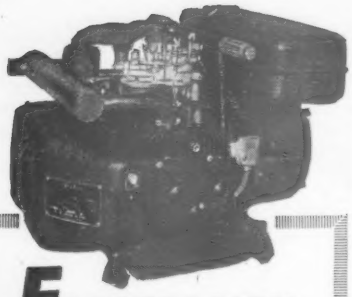

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the turn will tend to dig into the water and he may capsize.

Another situation in which the pilot must allow for weathercock action occurs when the plane approaches a runway or beach on anything other than an upwind course. It is, under such circumstances, a common fault to close the throttle too soon because of the fear of striking at too high a speed with the result that the plane weathercocks around out of control just at the moment when contact should be made. As a matter of fact, if a water plane is plowing along at about 700 or 800 r.p.m. and is allowed to hit the runway without reducing speed, there will probably be less shock than if the throttle is cut about 20 feet offshore. The reason for this rather strange phenomenon is that the bow wave cushions the floats when the plane strikes at constant speed, whereas, with power abruptly reduced, the bow tends to drop while the bow wave shifts aft and tends to lift the stern, with the result that the plane is urged forward bow down, just at the moment when contact is made. Generally speaking, it is always safer to hit a bit harder than to miss. To maintain a slow but constant rudder movement from side to side is also a help, since it establishes the fact that the plane will respond when necessary.

One or two other thoughts are worth considering in connection with these types of normal maneuvers. Unless it is absolutely necessary, never approach a runway or narrow beach while the plane is being turned. Get away from things and out into the clear—make the turn—and then come in on a straight course. This will give you time to feel out the plane on the course you intend to follow—it permits your finding the slowest and therefore the safest speed which will give positive control and it removes the added element of uncertainty in judging when the craft will straighten out of the turn. It is well to remember, too, always to maneuver downwind from an objective providing conditions make this possible. When coming up to a boat or buoy with plenty of room to leeward, never attempt to steer straight for it unless the course already happens to be almost exactly upwind. Instead, head the plane considerably to leeward and then let it weathercock around so you can idle along to make contact on an easy up-wind course.

The concluding installment of this article will be published next month.

Occluded Fronts

(Continued from page 47)

surface winds are at their maximum, the upper front no longer presents a serious problem. Nevertheless, the safest thing to do is assume the presence of an active upper front in every occlusion.

To complete the parallel between the life cycle of a cyclone and a human being, the maturity of the cyclone begins its death. The process of occlusion starts near the low pressure center, when the cold front begins to overtake the warm front. This is when the cyclone's maturity begins. After the warm sector has been lifted aloft, and the requirements of gravity have been satisfied, the conflict between the cold and warm air ends and both fronts lose their characteristics. When this occurs, the cyclone begins to die.

Weather is no chance occurrence—it follows certain definite patterns based on physical laws. Aerology is still an inexact science but our definite knowledge is increasing steadily. A part of this knowledge is that cyclones follow certain specific courses or paths. They generally travel in "families" of three to five, which follow one another across a weather map. Cyclones in the northern hemisphere have a tendency to reach their period of greatest violence and then disappear in low pressure areas near Iceland or the Aleutian Islands, which makes those localities very important as sources of weather information.

The cold front, the warm front and the occluded front result from the movement of a low pressure center across the face of the earth. You should, therefore, constantly be wary of these fronts and their weather bands. Any indication of a low pressure center of a cyclone should receive the focus of your attention when you see it on a weather map.

Because the occluded front is a combination of a cold front and a warm front, the resulting weather is a combination of conditions that are associated with both fronts. The cold front's narrow band of violent weather, and the warm front's widespread weather area, occur in combination along the occluded front. Therefore, the flight problems of both the cold and warm front must be met when flying an occluded front.

Weather conditions accompanying both types of occlusion are about the same as far as flight operations are concerned. Both are preceded by a widespread area of warm front weather and each has an upper front along which the weather is typical of the cold front. Along this upper front the activity is particularly severe in either type of occlusion for a distance of 50 to 100 miles north of the warm sector peak. Avoid this area!

The primary difference between a warm front occlusion and the cold front occlusion is the location of the occluded front—the surface front—in relation to the upper front. In a warm front occlusion the upper front *precedes* the occluded front by as much as 200 miles. In the cold front occlusion the upper front *follows* by 20 to 30 miles.

Because of the counter-clockwise rotation of winds around the low center, there is a distinct wind shift associated with the occluded front. If you are flying at a low level from east to west through a cold front type occlusion, you will encounter the wind shift very shortly after you run into weather of the upper front. In the case of a warm front type occlusion you will encounter the upper frontal weather as much as an hour before the wind shift.

In the early stages of either type of

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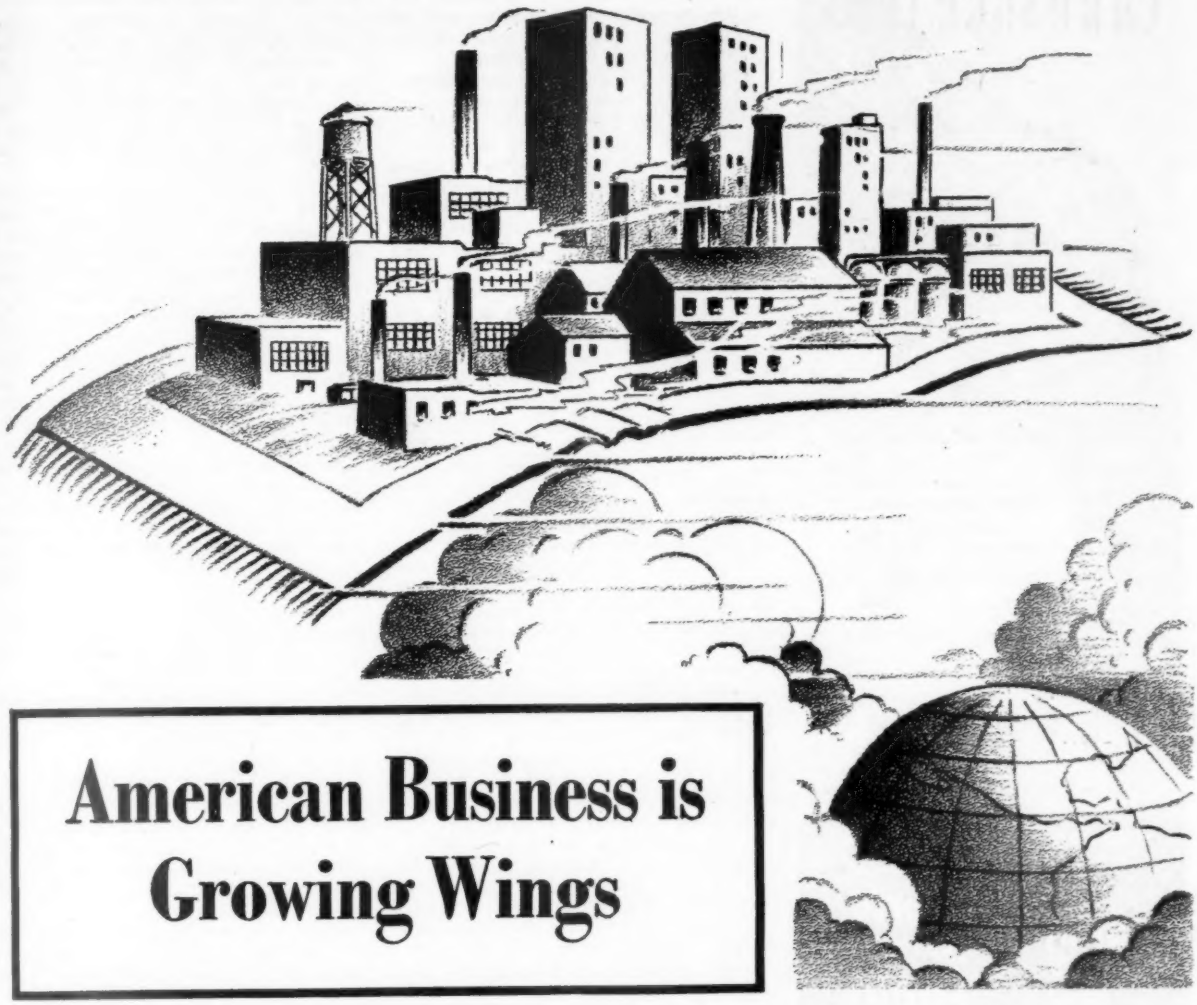

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occlusion, the wind shift is abrupt, but as the occlusion process progresses toward its later stages the shift becomes more gradual and is less intense.

The principal difference between the cold front occlusion weather and that of the warm front type is the width of the weather band. In the warm front occlusion, the cold air which follows the upper front, flows up over the warm front surface, causing clouds to form, generally of the cumulus variety, within the cold air. In this area precipitation and severe icing may be found.

In either type, the activity along the upper front is most violent during the early stages of the occlusion's development—when it is young and vigorous. As the occlusion process continues, this activity diminishes and the vertical clouds accompanying the upper front flatten out into layers. Both the upper front and the occluded front lose their frontal characteristics until in the final stages all that is left is a wide area of intermediate cloud decks which present no serious problems at either level.

When you plan a flight through an area of weather brought about by an occluded front it is imperative that you avoid the dangerous zone which extends 50 to 100 miles north of the warm sector peak. Choose a flight path which will take you at least 100 to 200 miles north or south of this zone. Particularly over areas where reports are scarce, it is difficult for the aerologist to locate this peak accurately. To protect yourself, take his estimate and keep a safe margin of distance away from this peak.

If your course is to the north of the peak, select an altitude that will permit you to avoid the activity of the upper front. The best altitude is generally at a level below 6,000 feet, if the terrain will permit. If your course is to the south, you will face the problem of flying both the cold and warm fronts individually.

From the air it is hard to tell when you are approaching an occlusion because it combines the appearance of both the warm front and cold front weather. If you are nearing the occlusion from the east, it will look like a warm front; if you approach it from the west, it will appear as a cold front.

The possibility of mistaking the identity of an occlusion could get a pilot into serious trouble. You might plan a flight which would cope successfully with a cold front by itself but which might bring grief in the widespread area of warm front weather on the other side. On the other hand, you might choose a flight procedure to meet warm front conditions alone only to meet with the unpleasant surprise of running into the violent activity of the upper front of the occlusion.

As in the case with ordinary frontal conditions it is extremely advisable to consult the weather bureau station before taking off on any extended cross-country flight. Where occluded fronts may be encountered this caution is doubled in emphasis:

1. Discuss with the weather bureau personnel the weather you will encounter
2. Study your weather map—get from it every bit of pertinent information.
3. Study all available upper air data (Winds aloft, temperatures, etc.).
4. Make a *definite* flight plan and include alternate airports.

The weather map and upper air data have every bit of essential information you need to fly a cold front, a warm front, or either type of occlusion. It will tell you how to avoid areas of low ceilings and poor visibility, icing and thunderstorms.

It can be your "life-saver"—but only if you learn to understand the significance of all that it is able to tell you. END

The Aviation Job Outlook

(*Continued from page* 34)

try now have towers in operation but at the great majority of these (102 as of February, 1945) CAA personnel is in charge.* The remainder are, of course, manned by airport employees. In addition, some airports employ a few aircraft mechanics to service planes landing there and all of them must have managers unless they are owned and run by fixed-base operators as are many but by no means all commercial fields.

Future programs of airport construction of course will greatly influence post-war employment opportunities in the industry. If Congress implements the CAA's national airport plan, this will mean the enlargement and improvement of more than half the airports now in existence and the construction of a few additional large air terminals and many smaller fields.

In total, there would be 6,305 airports, most of them civilian, within five to 10 years after the war, the date of completion depending upon the amount of state appropriations against which the proposed 50 per cent contribution of the Federal Government would be matched. The figure of 6,305 would be nearly three times the total number of airports at the end of 1940 and about two and one-half times as many as are in civilian operation at present. Although the number of very large air terminals would rise to 850, several times the number now in civilian operation, much the greatest numerical gain would be in small fields designed to accommodate only private or feeder-type planes.

If the figures on airport employment in 1942 are used as a guide, an estimate of about 50,000 to 60,000 airport employees upon completion of the national airport plan is suggested. This figure makes no allowance for increases in the amount of traffic per airport, however, and it also excludes municipal employees assigned to the airports and employees of restaurants and other establishments operated on a concession basis. Apparently including such employees and assuming a realization of their optimistic traffic forecasts, the CAA has arrived at a much larger figure—an estimated total of about

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125,000 jobs at the nation's 6,305 airports.

CORPORATE AND EXECUTIVE FLYING: Another field of employment for pilots and mechanics, important for its future potentialities rather than its pre-war or present size, is business flying by private corporations and civilian agencies of government.

Planes used in private business flying totaled 2,600 at the end of 1941, and since have tended to decrease in number as a result of the war. Many planes used in business flying are piloted by the company officials themselves or by employees of nearby fixed-base operators, and are garaged and serviced by these operators.

Ownership and use of planes for business purposes by Government agencies is in its infancy. A moderate upward trend may be expected after the war in corporate and executive flying. In a recent survey of petroleum producing and refining companies, two-thirds of the companies reporting (29 out of 44) said they were planning either to buy planes for the first time or to increase their fleet after the war, but one-third neither owned planes currently nor anticipated buying any.

In the immediate post-war period the Forest Service expects to have a slightly larger fleet than at present and to employ as pilots former forest rangers who have learned to fly in the armed forces. The service does not anticipate a greatly expanded use of aircraft, however, until helicopters become a practicable means of transporting men and supplies to remote regions without landing fields.

GOVERNMENT REGULATORY AGENCIES: As civil aviation has grown in this country so have the service and regulatory functions of the CAA. Employment in the CAA's Federal Airways Service, for example, leaped from 1,800 at the end of June, 1936, to 3,200 in 1940 and then to 7,800 by May, 1945. The lighted mileage of the Federal Airways rose from 22,000 to 30,000 between 1936 and 1940, and now exceeds 36,000 miles.

In operating this highway system of the air and regulating the traffic that passes over it, the CAA employs most of the communications personnel in the field of aviation, including thousands of airport and airway traffic controllers and other radio operators and hundreds of radio technicians. This service also has on its staff a few pilots and mechanics to handle the planes used in airways inspections.

That there will be continued growth in these branches of CAA can hardly be questioned, in view of the expansion in scheduled, non-scheduled commercial, and private flying which is in sight. The volume of activities and employment in these agencies will, however, be determined not only by the increase in air traffic but also by the application to civilian uses of secret wartime developments in radio and radar, the future policy of the CAB with regard to the examination and licensing of aircraft and airmen. In consequence, the most definite statement as to employment prospects which can be made is that the rate of increase is likely to be slower than in the airlines, as it has been in the past, and also slower than in fixed-base operations and other flying services.

AIRLINES: In considering how many flight personnel, mechanics and other skilled workers are likely to be employed in post-war transportation, the Bureau has relied heavily upon the Warner (Dr. Edward P. Warner, former chairman of CAB) and Curtiss-Wright studies. If the forecast of 1,200 to 1,700 planes in domestic operations made by Dr. Warner should be realized by 1950, this would mean a 250-400 per cent increase within one decade in the numerical strength of the domestic fleet. The increase in its passenger and cargo-carrying capacity would be much greater still, owing to the anticipated use of larger and faster planes, at least for long-distance and main trunk-line service. Similarly, the expansion in flight personnel would exceed that in numbers of planes.

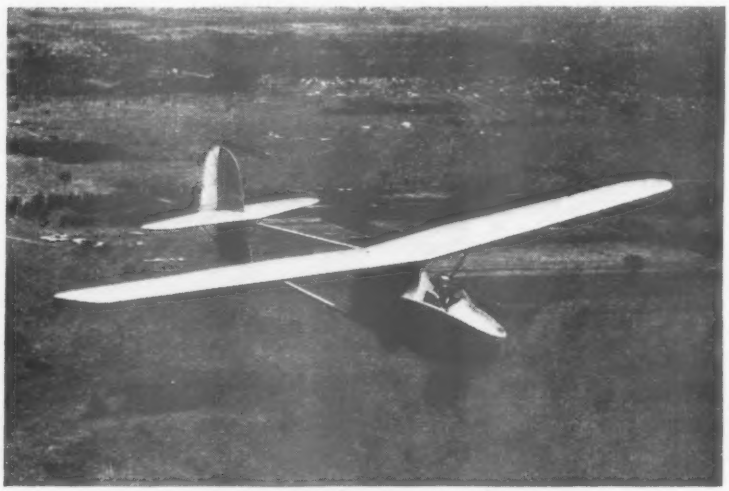
Other things being equal, the number of crews required varies with the number of hours the planes are used per day. With the return of peacetime conditions, aircraft utilization is likely to decline somewhat from its present great intensity. More planes will then be available to the airlines, and since people will tend to be less willing than now to travel at any time they can get transportation, there will be pressure to concentrate flights at convenient hours of the day and also to schedule additional flights at weekends and other periods of peak loads.

It is, however, assumed in the Warner and Curtiss-Wright studies that the carriers will be successful in holding utilization above pre-war levels, which would be desirable in view of the relation to operating expenses. This line of reasoning obviously implies that the average number of crews after the war will be somewhere between the pre-war and the wartime figures, perhaps 3.5 or four per plane.

Taking these various factors into consideration, it seems likely that the use in domestic operations five years after the war of 1,200 to 1,700 planes would mean the employment of about the following numbers of flight personnel:

Pilots and co-pilots, 9,500 to 12,000; flight engineers, 800 to 900; stewards and stewardesses, 6,000 to 6,600; total, 16,300 to 19,500.

These figures, which are illustrations rather than forecasts, of course, take no account of factors now immeasureable or unforeseen that may nevertheless affect personnel requirements by 1950. The figures are approximately in line with confidential forecasts of total employment in domestic operations made by one major airline and low in comparison with rough estimates by another company. Nevertheless, they are believed to be an optimistic picture of post-war employment opportunities. If the estimates of numbers of planes in the Curtiss-Wright study should prove to be correct, only about 5,000 pilots, 400 flight



CANADIAN SAILPLANE

A NEW type of sailplane, the *Sparrow*, was test-flown recently from a Toronto airfield. Built by employees of the Canadian de Havilland Aircraft Company, the craft was designed by W. J. Jakimiuk and Waclaw Czerwinski, Polish refugees employed by the aircraft company. Czerwinski was assistant professor of aircraft design and aerodynamics at Poland's University of Lwow.

The motorless craft lands at 23 to 25 m.p.h. and has a minimum sinking speed of 2.8 feet per minute with a pilot of average weight at 30 m.p.h. Its total length is 22 ft. 6 in.; span, 38 ft. 4 in., and its total weight is 449 pounds.

Considerable wing wash-out has eliminated spin characteristics if the plane is stalled. Tested by Tadeus Tarczynski, test pilot with de Havilland and former long distance gliding champion of Poland, the novel sailplane has been soared for 2 hr. 15 min. on one flight.

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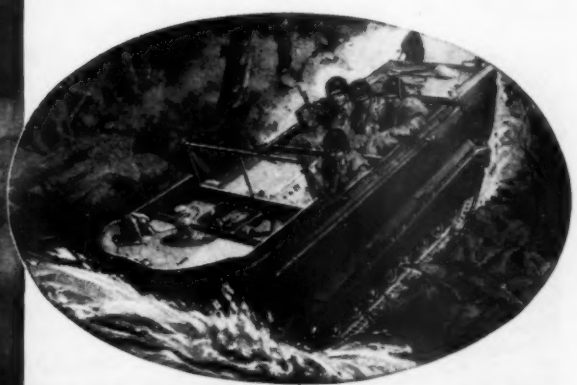


The Weasel was a "Champion" in action—designed by Studebaker engineers—built in the Studebaker factories

engineers and 3,300 stewards and stewardesses are likely to have jobs in domestic operation in 1950.

The likelihood is that about 30,000 mechanics will be employed in domestic operations if Dr. Warner's predictions as to passenger traffic come to pass, but only about 15,000 if the more conservative forecasts of the Curtiss-Wright study prove correct. For international and territorial operations, the most probable level of employment in the occupation would be 5,000 to 10,000, depending on the efficiency of operations, assuming a realization of the Curtiss-Wright forecasts. These figures cover not only all-round engine mechanics but also aircraft structural mechanics, specialists such as radio and instrument repair men, semi-skilled helpers, line maintenance men.

With regard to the proportion of men planning to seek aviation jobs after demobilization, the information presented comes from questionnaire surveys of the post-war employment intentions of small samples of Army Air Forces personnel. What may happen to these intentions when the men are face to face with the realities of the post-war labor market is a question obviously unanswerable for the present. It is nevertheless significant that, in all occupational groups covered, only a minority of the men said they were planning to use their Army skills in their *first* post-war jobs, although the exact proportion varied considerably from one occupation to another, depending in part on the men's opinion as to their chances of finding such work. END

Should You Scrap Your Radio?—Yes

(*Continued from page 24*)

and sturdy. The new frequencies will permit directional or semi-directional antennae. In other words, high frequencies can be directed (steered) with simple antenna arrays. The old frequencies could not, due to the lack of sufficient space on the aircraft.

This discussion would not be complete without an explanation of the comparative behavior of low and high frequency radios and why a change is required.

An invisible atmospheric blanket, known as the "heaviside layer," covers the earth. It moves up and down continuously. The lower radio frequencies bounce off this layer like the cue ball on a billiard table cushion. The deflection results in dead spots and fading.

On the other hand, high frequencies travel in all directions and follow a "line of sight" technique. These may be directed easily by suitable antenna systems. They, like the radio range, may be confined to areas where flying is prevalent. Static, too, is not bothersome.

By concentrating the radio frequency power of the ground station, even greater reliability is had for communications.

The cost of new equipment should not be out of reach of the private flyer. It is all a matter of demand. The more flyers, the lower the cost of sets. Does equipment need to be "custom built"?

Let us consider some of the wartime developments in communications and the prices paid for the equipment. Take the handie-talkie for example. The Government paid more than $200 apiece for these comparatively simple two-way sets. The high price did not result from expensive parts and accessories but from the manner in which they were built, the finesse of the assembly and the careful testing involved to insure reliable communications. The newly-assigned citizens' communications band will find wide use for these little sets. But, we know full well that they could not market for anywhere near the price paid by the Government for similar equipment. While the circuits and component parts will no doubt remain much as they were in the past, they will be mass-produced in quantities employing a cheaper grade of parts than were used heretofore. Short cuts in wiring and assembly will further reduce the initial cost.

The history of police communications is a good analogy of cost comparison and what we may expect in future units designed for the private flyer. When two-way sets were first installed in mobile units the cost was terrific. Units had to be strictly custom-built for their particular application. As more and more communities adopted police radio communications prices came down simply because it was possible then for the manufacturer to employ mass production methods.

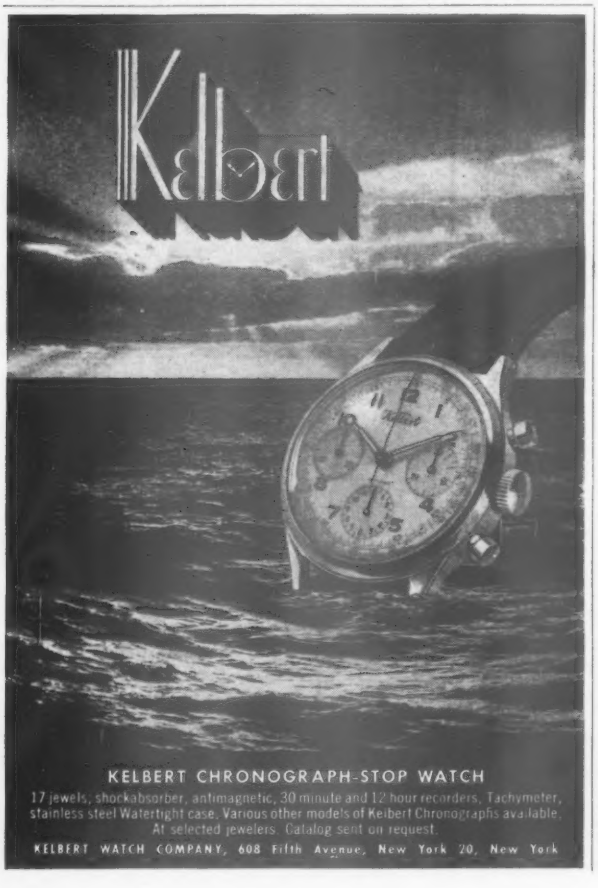
The development of radio communications must of necessity have a starting point until the demand for specialized units makes it possible for the maker to show a profit with low-priced items.

How does this all affect the equipment that will find its way to the private plane? We must consider first, for example, that inexpensive resistors costing around two cents apiece are not the proper choice for installation in a private plane's radio. We must consider the extreme changes in temperature and humidity encountered by the equipment and precautions must be taken with each part so that it will not fail in service. Therefore, we find a two-cent resistor rising in cost to 10 cents or 15 cents each if it will meet the above requirements. If we consider the many component parts needed in the final assembly, we will soon find our cost increasing by many dollars compared with the home receiver or the auto radio.

Many purchasers of radio equipment for airplanes are under the impression that there are only one or two suppliers of these special items. Such is not the case. Almost any manufacturer of communications equipment is highly qualified to compete in this market. You can bet that they are not asleep at the switch. Competition in this field should reach a lively pace in the very near future and competition means lower prices.

There are other difficulties, many of them mechanical, which must always be carefully considered by the design engineer. For example, the usual "haywire" type of wiring found in inexpensive radio receivers would not be suited for installation in an aircraft constantly undergoing a series of vibrations. The stuff simply would not hold up. Wiring must be most carefully cabled and lashed down to keep it in proper position. Shielding must be adequate to prevent coupling between various stages. Metal-cased condensers are widely used. These must be carefully riveted to the chassis. And, so it goes through the component list, each requiring special care in its selection, close tolerance and intelligent assembly.

This does not mean that prices for such equipment will remain high. It does de-



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pend upon the demands on the market for such specialized equipment. We have every reason to believe that price reduction will be accomplished soon. In the meantime, let us remember that new frequency allocations have not been selected as a personal whim of the FCC. Selection has been born of experiment and the technical know-how as to the best possible frequencies for any given type of radio service.

Yes—the change in frequencies will be outstanding benefit to the flyer. It's a good insurance policy.

A few will take a financial loss, that's true, but everyone will be repaid in full by having more reliable communications. Isn't it worth the price? END

Report from Washington

(*Continued from page 43*)

contract under which it had been operating a fleet of *Skytrains* between Newark and Pacific Coast points so that it could begin the non-stop schedules with *Constellations* has prompted a rumor that the experience in ATC transcontinental operations will be used later as the basis for an application for CAB certification of Pan Am as a coast-to-coast domestic carrier. Pan Am denies such a step is planned but adds that TWA won its North Atlantic routes on this basis.

International Maps

The Coast & Geodetic Survey has discontinued regional maps and, after some hesitation, has substituted for them international maps of the type originally issued by the Army. The internationals are brought up to date every six months, as were the regionals. The international maps carry circles which are filled in by quarters to indicate runway lengths. That is, one quarter of the circle is filled in if the longest runway is 3,500 feet or longer and so on.

Chief objection to the internationals is that they are based on parallels of meridian and do not show as much as did the regional maps. For example, on coastal areas three-quarters of the maps would show water because they don't overlap as much as the regionals did. While 17 regional maps were required to cover the entire United States, it takes about 37 internationals to cover the same territory. They are, of course, somewhat smaller than the regionals. The scale of the internationals is 16 miles to the inch, as were the regionals. Major advantage of the internationals is that they put the entire world on the same scale. The Coast & Geodetic Survey's sectional maps remain unchanged, except for the quartering of circles, and the scale is the same—8 miles to the inch.

Nonscheduled Air Services

Formal protests against the CAB examiners' recommendations in the investigation of nonscheduled air services are being prepared and it appears that oral argument in the case will produce a violent controversy. The examiners, William J. Madden and Curtis C. Henderson, concluded that there should be established a classification known as fixed-base air carriers, who would be required to file with CAB a notice of intent to operate, the airport or airports selected as the base of operations, names and citizenship of persons holding more than 75 per cent of the stock, a description of the type of air carrier services to be offered. Such carriers would be limited to 10 trips a month from the base of operations to any single destination.

Opposition to the proposed regulation is led by the National Aviation Trade Association and the Non-Scheduled Advisory Committee and supported by such individual operators as Simsbury Flying Service and Southern Airways and by the Department of Commerce. NATA contends that their operations comprise an important contribution to aviation generally and that since they have not yet reached a large volume of traffic any extensive economic regulation or curtailment of business would be burdensome. NATA asks that two or three years more be allowed to elapse before any regulation is applied to fixed base air carriers. The Department of Commerce urges that no attempt should be made to force the development of contract and charter services into precon-

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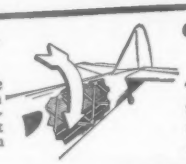

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ceived channels by regulation before their true nature and potentialities are known.

DC-6 Power Plants

Douglas Aircraft Company is experimenting with three types of power plants on the DC-6. Radial and Allison liquid cooled engines and jet units are being tested for installation in the big plane. No decision has been made so far. The DC-6 is still in the mock-up phases of development.

Published reports that the Lockheed *Constitution* will be flying by the end of the year now appear to be premature. Despite the speed with which production is being carried on, there appears to be no promise that this big plane can make its maiden flight until some time next summer.

Rotocraft

Although the manufacturing industry and the CAA have reached accord on airworthiness requirements covering rotary wing aircraft, the new proposed Part 06 of the Civil Air Regulations has not yet been submitted to CAB for hearings. The Aircraft Industries Association recommendations to CAA suggested the word "rotorcraft," rather than "rotorplane," as the best one-word identification of rotary wing craft. Beech Aircraft Corporation dissented, suggested that the question of the name should be co-ordinated with NACA's standardized nomenclature.

Swiss Air

Representatives of Swiss Air have ordered from Glenn L. Martin Company two *Mars* flying boats for international operations between Geneva and Baltimore, with New York as an alternate port of entry. Non-stop flights between the United States and Switzerland are contemplated. END

London Letter

(*Continued from page* 49)

William Leonard and Arthur Woodburn as Parliamentary Secretaries.

Short, quizzical and anxious to please, Lord Stansgate is the holder of the Distinguished Service Order and the Distinguished Flying Cross. As Director of Public Relations at the Air Ministry he worked quietly and hard. He initiated no reforms, made no special efforts to obtain publicity for the RAF, but on the other hand kept the critics quiet. He has lectured in America. Wing Commander John Strachey, his Parliamentary Under-Secretary, first came into prominence as a broadcaster on the air war. With a clear, school-mastery style, he kept the public informed about RAF views on bombing and similar matters over the B.B.C. transmissions.

With Stansgate and Winster both in the House of Lords, the main responsibility for answering awkward Parliamentary questions about the RAF and about civil aviation will devolve upon the Under-Secretaries.

Naval Rivalry

Adm. (Air) Sir Denis Boyd is an admirer of the United States Navy. When I

talked with him a short time ago he placed emphasis upon the fine work of the United States Navy and especially upon the way it had collaborated with the British Royal Navy.

The British task force which operated off Tokyo, according to the reports of July 17, included the British aircraft carrier *Formidable* and was under Vice-Adm. Sir Philip Vian. British carriers were less lavishly fitted than American but their personnel had been anxious to play a full part in the Pacific war. Had the atomic bomb not forced the end, the Royal Navy would have made its weight felt in the Far East.

Braking Propellers

The de Havilland company, which is producing various types of propellers capable of reversing their pitch for air braking purposes, prefers the term "braking" to "reversible," on the grounds of accuracy.

The three-bladed de Havilland braking propeller for *Gipsy Queen* engines for the new de Havilland *Dove* feederline aircraft is 7½ feet in diameter and weighs 130 pounds. An additional 30 pounds must be added for the spinner and for feathering equipment and control unit. This propeller has a rate of pitch change of about 20° per second.

Another de Havilland propeller which is going to be of interest to private airplane owners is the small two-blader. This has a hand-operated pitch change mechanism and is light in weight and cheap in price. It was originally tested on the *Moth Minor* with 90-hp. *Gipsy Minor* engine just before the war, but development was held up by operational requirements.

Air-Borne Bullocks

Eire is striving to utilize modern development for the benefit of its agricultural industry.

One proposal, made by Senator J. J. Counihan and to be brought before the Senate by the Irish Cattle Traders' and Stock Owners' Association, is for the conveyance of agricultural produce and of livestock by air.

Irish cattle have long been famous and it is believed that their market value in Britain and on the Continent of Europe is sufficiently high to warrant high-speed transport being used for them.

Another sign that the food producers are looking to the airways for the transport of their wares is given by Billingsgate Market, the London fish-selling center, noted for its smell, leather hats and bad language, which proposes to convey barrels of fish by air.

Egyptian Airways

One of the new airlines formed in readiness for the institution of the British Empire and Commonwealth system of air communications, is a combination of British Overseas Airways Corporation and Misr Airlines. It is to be known as Egyptian Airways and the discussions which led to its formation took place in Cairo. Initial capital is $1,000,000, airline is to operate between Britain and Egypt. END

I Learned About Flying from That!—No. 73

(*Continued from page 48*)

was no hydraulic pressure left. This translated itself in a rather high landing speed, approximately the top speed of a fair-sized trainer, 120 to 125 m.p.h. Nevertheless, I'd been lucky in estimating my approach and we hit the ground not more than 200 feet from the tower. Having a tricycle landing gear, I landed with the brakes on. This didn't do us any good as I had forgotten that my hydraulic pressure was gone. I grabbed for the emergency air brakes and slammed them on. When using the emergency brakes, the only way left to steer is with your rudder—if you have sufficient speed.

We were attacking the runway on a bias, and the ground on either side was rough. As we found out seconds later, there were small grass-covered ditches here and there. These ditches were not more than 10 or 12 inches deep, but they certainly were hazards. We were bouncing up and down so hard I still do not understand how the landing gear took it without collapsing. There were dozens of planes all over the field. I have never seen so many planes scattered about on an airport. Fortunately no take-off or landing was in process. Our first "enemy" was a *Mustang* in front of me and a little to the right. I always had a weakness for the P-51, so one good kick on my left rudder and we spared it.

Next, and directly ahead, were two *Mitchell* bombers. This also was quite easy to handle as our speed was still over 100 m.p.h., which left our rudder still effective.

Then came the toughest of all—another *Mitchell* in front and a little to our left. A crew of mechanics was working on her. I was bracing myself against the right rudder with all my weight, but it seemed that we had to hit this time. I closed my eyes for an instant, waiting for the impact. It never came. Later I found out that our left wing tip had passed under the wing tip of the *Mitchell*.

For a second I thought we were safe and my only fear was that the nose wheel would collapse, when, to my despair, a huge concrete revetment appeared straight on our course, only a couple of hundred yards away. If you have ever seen such a revetment, you'll easily understand how I felt. I remembered that we were carrying some 300 pounds of lead ballast, just behind the first observer's seat and I was already visualizing the two of us compressed between lead and concrete.

We were heading straight for it. I could feel no reaction or change of direction whatsoever, although I was pressing with all my might on the left rudder. It made me angry because there was nothing more I could do. We were now at not more

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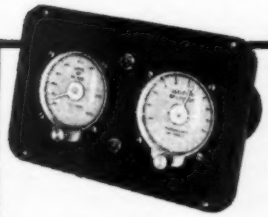

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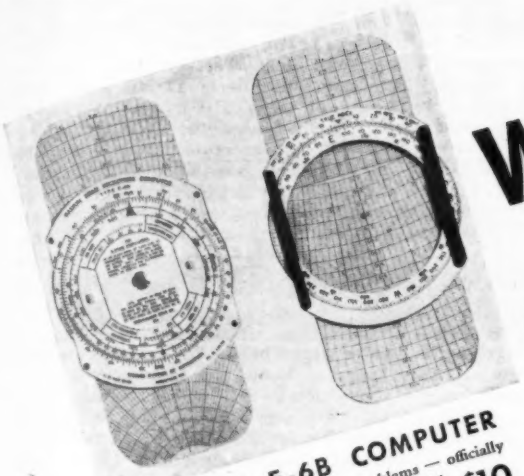

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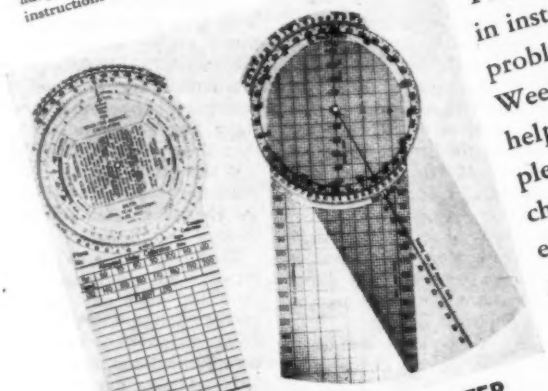

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than 75 yards away, when the plane started to bank slightly to the left. As the bank increased the left wing began to drag on the ground, which naturally turned us promptly to the left. We missed the revetment by not more than 30 yards and stopped a few seconds later. What had happened was that the left landing gear finally broke through the left wing's structure, in back of the engine mount. The two engineers riding with me were unhurt, and I suffered a dislocated back.

The tower operator still does not know how we missed him and how we bypassed all the planes. The crew working on the B-25 kept running until they were out of breath. And each of my two observers now regularly celebrate two birthdays a year.

After I recovered sufficiently from my back injury, the Army representative and I went over the entire matter, step by step. Of course, the gas tanks were found to be absolutely dry. We filled them, then emptied them again, gaging every 10 gallons. We found that when there were 20 gallons left in each tank the gauges read approximately 50 gallons and when the gauges read 30 the tanks were empty. This does not mean that gauges are always wrong, but I think that when flying heavy aircraft, it is safer to guide yourself by consumption charts, based on power, mixture, time, etc., rather than depend only on gauges. You learn about flying that way. END

Should You Scrap Your Radio?—No

(*Continued from page* 25)

new VHF sets in my plane during the transition period, I'm worried not only about the nuisance of doubling up, but about cutting down my allowable baggage load. Will I have to have a new weight and balance check run on my plane just for this transition period?

Another thing I notice, as a private pilot, is that the new VHF bands will be more valuable to commercial operations than to me. This is because the VHF waves travel in a straight line and will not dip below the horizon. The commercial planes fly higher than we private pilots and so have longer range. At private plane levels of around 1,000 feet I might be able to hear the signals up to 46 miles, but a plane at 10,000 feet will be able to hear them over 100 miles. It's very unlikely you will find me at 10,000 feet. Now if the CAA installs ranges at intervals of 90 miles, we low-flying boys are going to have a lot of territory where we can't hear or be heard.

I grant that a lot of items such as cost, size, weight and complexity of VHF equipment cannot be definitely assessed right now because CAA, the Radio Technical Advisory Committee, FCC and the radio manufacturers are attempting to iron out technical problems on specific assignments and utilization of frequencies within the band allocated to aeronautical service. Until these problems are resolved, manufacturers won't know just what to build into sets. Without such specific information, cost, weight and size cannot be determined.

And maybe it is just such uncertainties that I'm worrying about. Here we're making great claims for something that may not turn out to be just as we imagine it.

I find that much of the criticism against VHF for non-scheduled aviation is misdirected against the radio manufacturers. The manufacturers cannot go ahead until they know exactly what requirements such equipment must meet. They don't know now whether the sets must have five frequencies or 18 frequencies, and the lack of that bit of information alone is enough to tie their hands.

There also is plenty of criticism leveled at the CAA's Federal airways service. Not all of it comes from private pilots and their organizations—several manufacturers have joined the chorus.

A representative of one radio manufacturing company made the flat declaration that the hullabaloo about the world of VHF can be attributed solely to CAA's "premature horn blowing" about the service. CAA's accomplishments have always lagged behind its promises, he said. Everyone knows, he continued, that the conversion to VHF will not be completed in time to serve the first "big lot" of personal planes to be sold in the next year or so. The private pilot's use of VHF will be limited by the lack of VHF ground facilities. The pilot, therefore, will only be able to use certain airports with VHF.

Manufacturers seem to agree that the VHF transmitters could be a simple affair that probably would cost much less than the standard low-frequency box. They are wondering, however, about the receivers. If they must incorporate a left-right indicator, say the manufacturers, then the meter for it will cost as much as a present-day light receiver itself. If it must also cope with omni-directional visual ranges, its cost will be increased further.

Thomas B. Bourne, director of federal airways for CAA claims to have an answer for some other questions. He has predicted that there will be VHF equipment in every control tower and every communications center by January 1, 1946. Approximately 70 instrument landing systems will have been installed by June, 1946, in addition to Army facilities of that type available.

Non-scheduled flying should stop worrying about the transition period, Bourne declares. The changeover to VHF will not be completed for three years and CAA has never planned to discontinue lower frequency services until the $20,000,000 VHF installation project is at least 80 per cent complete. In the interim, Bourne says, pilots can continue to use low frequency sets on the channels 3105 kilocycles (ground to air) and 6210 kilocycles (air to ground) that have been available for years.

Bourne says that ultimately the biggest customers for radio are going to be the private flyers.

"The VHF ranges, both two-course visual and omnidirectional visual," he claims, "will guide the pilot along the airways and provide him with weather and traffic control information. Initially, it is planned that one simultaneous voice channel will be available on all VHF ranges for ground to air, two-way radio communications. If it is found that one voice channel will not be adequate to provide two-way communications for both traffic control and weather information at a given location, consideration then will be given to the matter of providing an additional channel so that one

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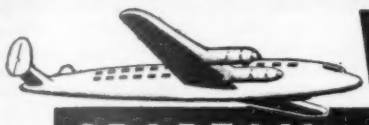

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channel will be available for traffic control transmission and one for weather transmissions, whichever is the more practicable.

"As the pilot approaches the airport of intended landing, the runway localizer of the instrument landing system will provide guidance to the airport and approach instructions from the control tower will be available on the simultaneous voice channel of the localizer. If the pilot desires the additional benefits of the glide path, a glide path receiver operating in the 328.6 to 335.4 megacycles band would be necessary.

"However, as far as the private pilot is concerned, it would appear that most of them will be satisfied with the guidance of the runway localizer only, due to the maneuverability and slower speeds of the average private aircraft. After the pilot has completed his approach and is under the overcast, he will shift his receiver to the control tower's local-control frequency in the 118-112 megacycles band for final instructions in preparation for a landing. After the aircraft is on the ground and off the runway in use, the pilot will shift frequency once more for taxiing and parking instructions from the tower.

"Thus, it will be seen that the whole plan of the CAA for navigation, communications and traffic control contemplates that it will be possible for the average private pilot to obtain all the essential airways services through the use of but one receiver.

"This receiver must be capable of covering the frequency band of 108 to 132 megacycles without interruption, either by push-button or by tuneable control, or perhaps by the combination of both. With this one receiver the pilot will be able to receive navigational guidance along the airways, navigational guidance for instrument approaches and all the essential two-way radio communications while enroute and while landing and taking off."

Thus, one man's opinion.

The receiver described by Bourne should, he said, cost no more than a good low frequency receiver. He does not agree that a VHF receiver with far more dependability and greater utilization than the low frequency set should sell for an inordinately higher price. One manufacturer pointed out, however, that if as many as 18 frequencies are going to be utilized the cost of receivers will take a sharp jump.

Until all VHF problems are ironed out, manufacturers will not begin to manufacture sets designed for its use. However, with ground facilities available in the standard low frequencies, manufacturers are turning out that type of equipment for use in the first post-war lightplanes. One manufacturer has announced a combination receiver-transmitter of that type to sell for about $100, exclusive of headset and other accessories. Others will offer receivers and transmitters separately, the two selling for slightly more than $100.

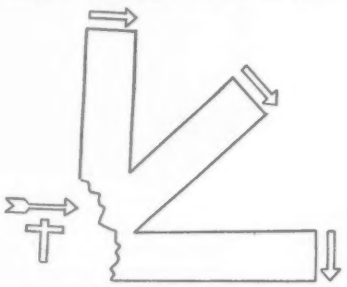
But as for VHF sets, about all we can do is wait and see. My own tongue, despite all the pleasant assurances from Washington, remains in my cheek. END

Letters

(*Continued from page* 64)

itinerant pilot is to circle the field?

Simpler still might be an arrow used



in conjunction with the wind-tee, showing whether the field has a right-hand or left-hand circle rule.

ELWOOD L. GOSSE

Sheboygan, Wisc.

● Thanks to Reader Gosse, for an excellent suggestion.—ED. END

PITY THE OPERATOR

Sirs:

I am a fixed base operator now overseas, and have just read your article "How Not to Run an Airport," June, FLYING. I agree whole-heartedly that such conditions exist at many fields but don't think you took into consideration that many operators have been operating at a loss during wartime.

The model airport used in the "Here's How to Run an Airport" was aided, undoubtedly, by government contracts and was probably municipally supported.

Please give a little credit to the large percentage of operators who struggled along for years, doing their best with the facilities available.

LIEUT. JOHN HARRIS

APO, New York, N. Y.

● That the majority of fixed-base operators have *not* done their best with the facilities available was precisely the point of How Not to Run an Airport."—ED.

FLIGHT PAY REFUNDS

Sirs:

There are a few discrepencies in the pay chart you show with the article "Flight Pay in the Services," FLYING's April issue.

First, an Army warrant officer receives a 20 per cent increase in his base pay for overseas service and not 10 per cent as you state. Second, his rental allowance with and without dependents was shown transposed in the chart. He gets $60 without and $75 with dependents.

CWO R. G. SNYDER

APO, San Francisco, Calif.

● Reader Snyder is correct in his statements, and we regret the unnoticed transposition of dependency figures. These tables were provided us and checked by Army authorities before publication.

All ranks and grades are eligible for flying pay, including five-star generals and

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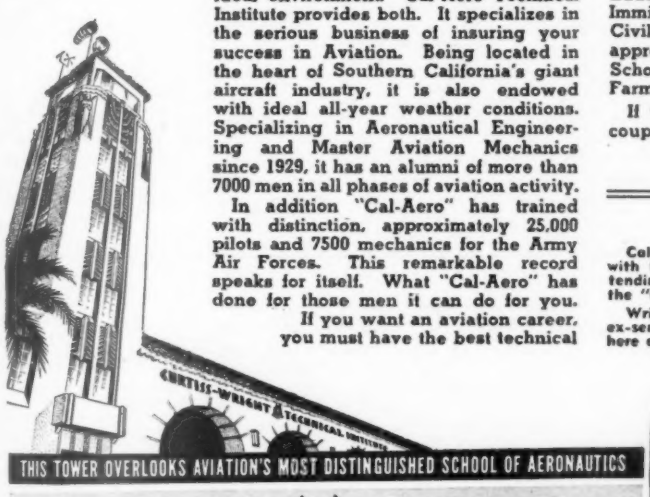

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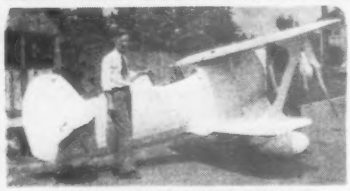

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THAT FORK-TAILED DEVIL

Sirs:

It was *Mustangs* and *Black Widows* of the 7th Fighter Command that first gave escort to the *Superforts* on Iwo Jima, not the *Lightning* as you stated in your article, "The Fork-Tailed Devil" in FLYING's August issue.

HENRY F. SCHOOB
Rhinebeck, N. Y.

● We stated that *Lightnings* provided first fighter cover over Iwo Jima with no mention made of *Superfortress* escort. At the time the fighter plane cover we referred was used, Iwo Jima had not yet been won.—ED.

Air Schooling for Milady

(Continued from page 42)

a commercial license and an instructor's license. Approximately 150 girls receive actual flight instruction each year after they have passed ground school courses and requirements.

While these Stephens College girls are learning aviation, they are living it as well. The college has a separate aviation center located directly across from the Columbia Municipal Airport. Ninety-six aviation students reside in a rambling four-story residence hall, commuting by bus to the main campus for other classes. Next to Aviation Hall is the student "Skylanes" tearoom combined with a large dining room similar to the regular campus dining halls.

On the airport is the college's own hangar with facilities for 20 planes and its own complete shops, servicing facilities, and mechanics, including full maintenance crews.

Flight equipment includes a fleet of 18 planes. Fourteen Aeronca *Super Chief* side-by-side cabin trainers, one completely equipped for night flying, one four-place deluxe Fairchild 24, completely equipped for blind flying and with two-way radio for cross-country instruction; two Fairchild M-62 open trainers for advanced maneuvers, one four-passenger Beechcraft, and two Link Trainers for instrument flying are used in the flight program.

Ground school equipment includes all instruments, one P-35, one *Gypsy Moth*, one L-3B, one L-1, two PT-19's, numerous sub-assemblies, and six airplane engines ranging from 65-h.p. to 1,250-h.p., complete film libraries, charts, books, models and other necessary equipment for instruction. Much of this was surplus Army Air Force equipment, loaned to Stephens for the aviation program.

The aviation staff includes 21 instructors and supervisors. All ground school and flight instructors are rated and approved by the CAA.

Education is the business of Stephens College and the girls are learning by doing. They work on both liquid-cooled and air-cooled engines and on the various types of planes in the laboratories and shops.

The Stephens student, however air-minded she may be, studies more than aviation. She is required to have her share of science, literature, and other required subjects just as a student taking any functional college course. One young woman is studying child psychology along with several courses in aviation. Most of them are working on their requirements for A.B. or B.S. degree.

The program at Stephens is functioning with the active co-operation of the Army Air Forces, the Civil Aeronautics Administration, and 12 of the country's leading airlines. The airline companies are taking the girls into the business world as rapidly as Stephens College can train them. END

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